

**Marine Biological Survey
Pinellas County Shore Protection Project
Comprehensive Borrow Area Study**



February 2002

**Prepared for:
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EXECUTIVE SUMMARY

Dial Cordy and Associates, Inc. (DC&A) was contracted by the U.S. Army Corps of Engineers (USACE) to conduct a biological survey of proposed borrow areas in conjunction with the Pinellas County Shore Protection Project. The barrier island beaches of Pinellas County, Florida have had serious problems with shoreline erosion and a lowered beach profile caused by storms, wave action, and currents. To accommodate future nourishment projects, nine offshore borrow areas and four ebb tidal shoals have been identified for consideration as probable borrow sites. Two nearshore areas for use as potential breakwater areas were also identified and mapped for marine resources.

Prior side-scan mapping showed extensive areas of consolidated material within each of the proposed borrow areas (2,309 acres). This survey was used to map and characterize the extent of marine resources in relation to the previous side-scan survey. In total over 15,000 acres of seafloor were mapped using towed video, diver surveys and integrated GIS mapping. Habitats identified with towed video mapping were further characterized by diver surveys. During diver and video surveys living hardbottom resources were characterized by percent coverage and relief. Dominant fishes and invertebrates were also documented. An additional 1,519.6 acres (3,828.6 acres total) of live-bottom habitats were identified and mapped within this study. Within the offshore borrow areas, over 75 percent of the habitat surveyed was open sand (10,000.4 acres) while the remaining 3,828.6 acres consisted of hardbottom habitats. The ebb tidal shoal areas of John's Pass, Blind Pass, Pass-A-Grille, and Egmont Channel all consisted of only open sand habitats.

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1.0 INTRODUCTION

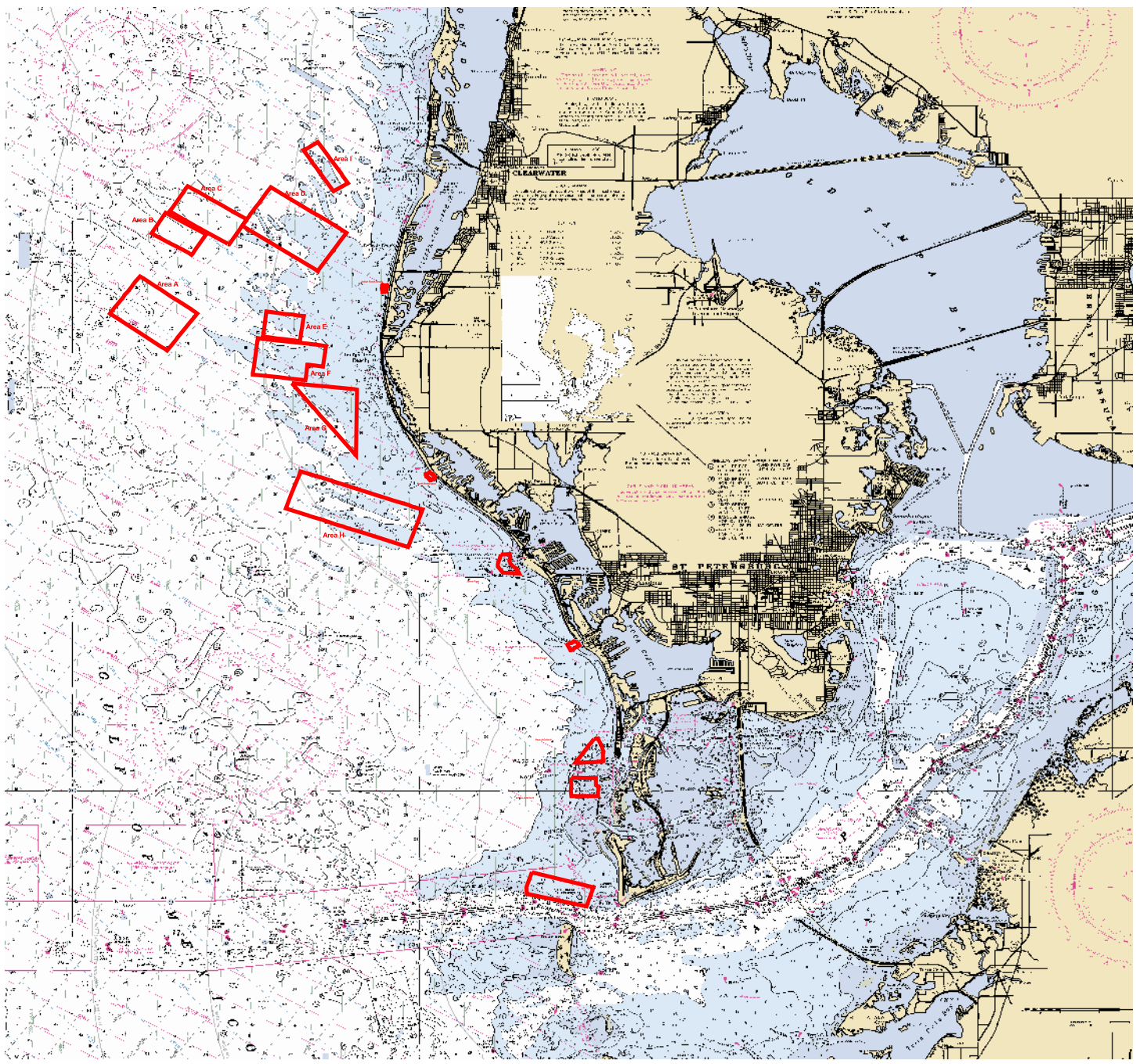
Dial Cordy and Associates, Inc. (DC&A) was contracted by the U.S. Army Corps of Engineers (USACE) to conduct a biological survey of proposed borrow areas in conjunction with the Pinellas County Shore Protection Project. This work was conducted under contract No. DACW17-01-F-0060.


1.1 Purpose and Need

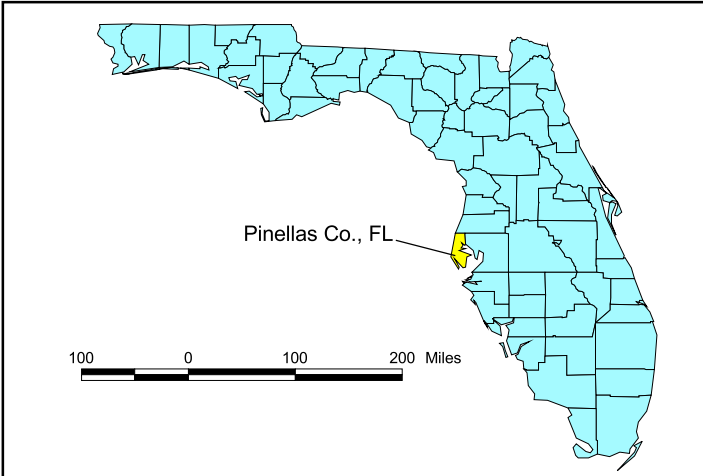
The barrier island beaches of Pinellas County, Florida have had serious problems with shoreline erosion and a lowered beach profile caused by storms, wave action, and currents. As a means of controlling this erosion and increasing storm protection to the island, fill material has been placed along the shoreline. Recent fill projects have included Clearwater Beach, Mullet Key, Treasure Island, Sand Key, and Long Key. Traditionally, the material for these and other beach nourishment projects for the Pinellas County Shore Protection Project was obtained from Egmont Channel Shoal. However, in order to utilize the sand from Egmont Shoal for nourishment of Pinellas County beaches it must be moved a long distance (11-25 miles). This is not always cost effective. To accommodate future nourishment projects, nine offshore borrow areas and four ebb tidal shoals have been identified for consideration as probable borrow sites. These sites were surveyed and the results discussed herein.


1.2 Location

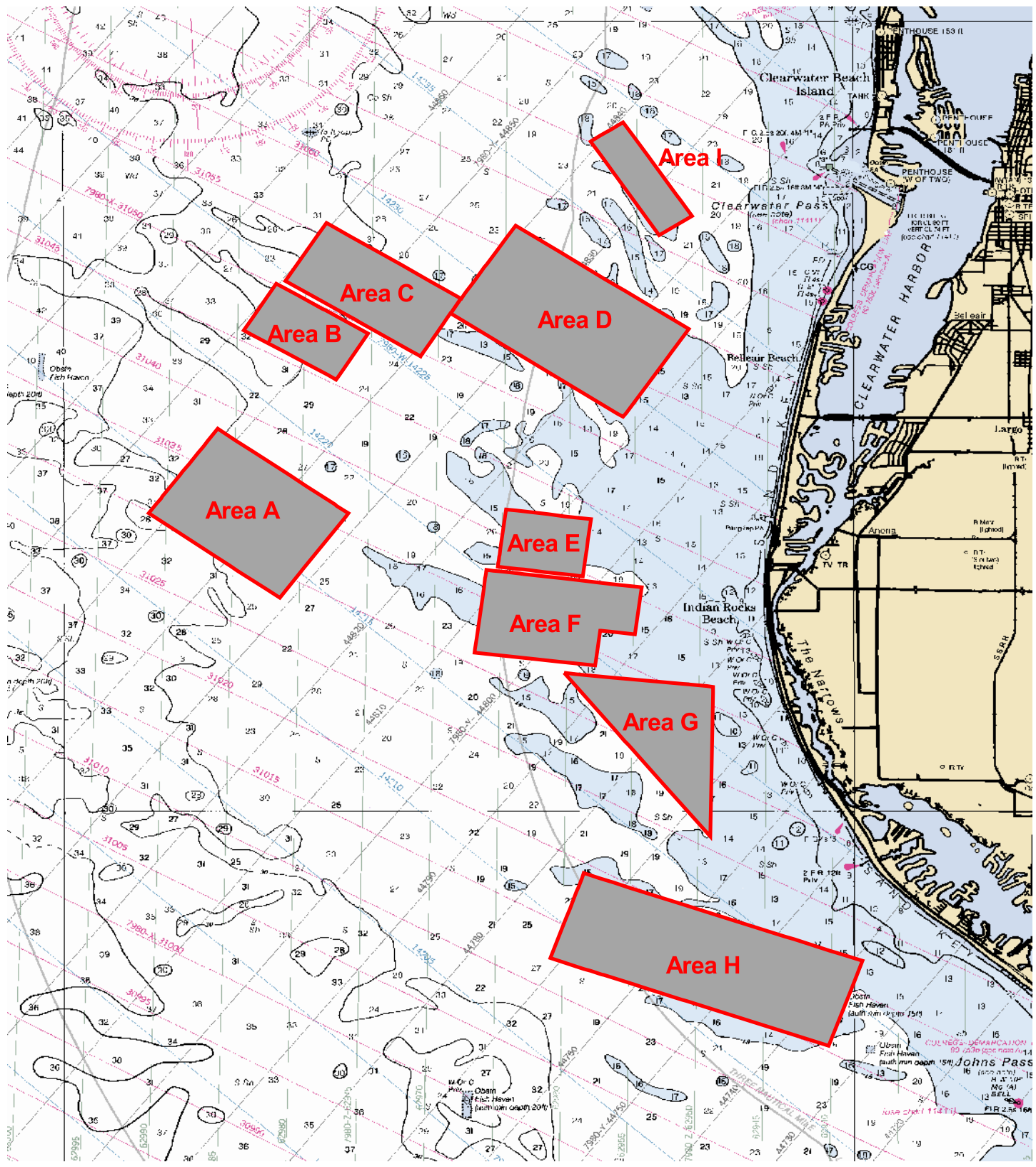
The project area surveyed is located off the Gulf of Mexico coast of Florida, Pinellas County Florida (Figure 1). Specifically, the investigation included nine potential offshore borrow areas (Figure 2) and five ebb tidal shoals (Figure 3). Additionally, two potential nearshore breakwater areas were also surveyed along North Reddington Beach and Indian Rocks Beach (Figure 4).

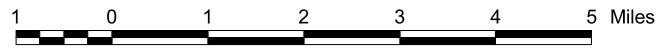
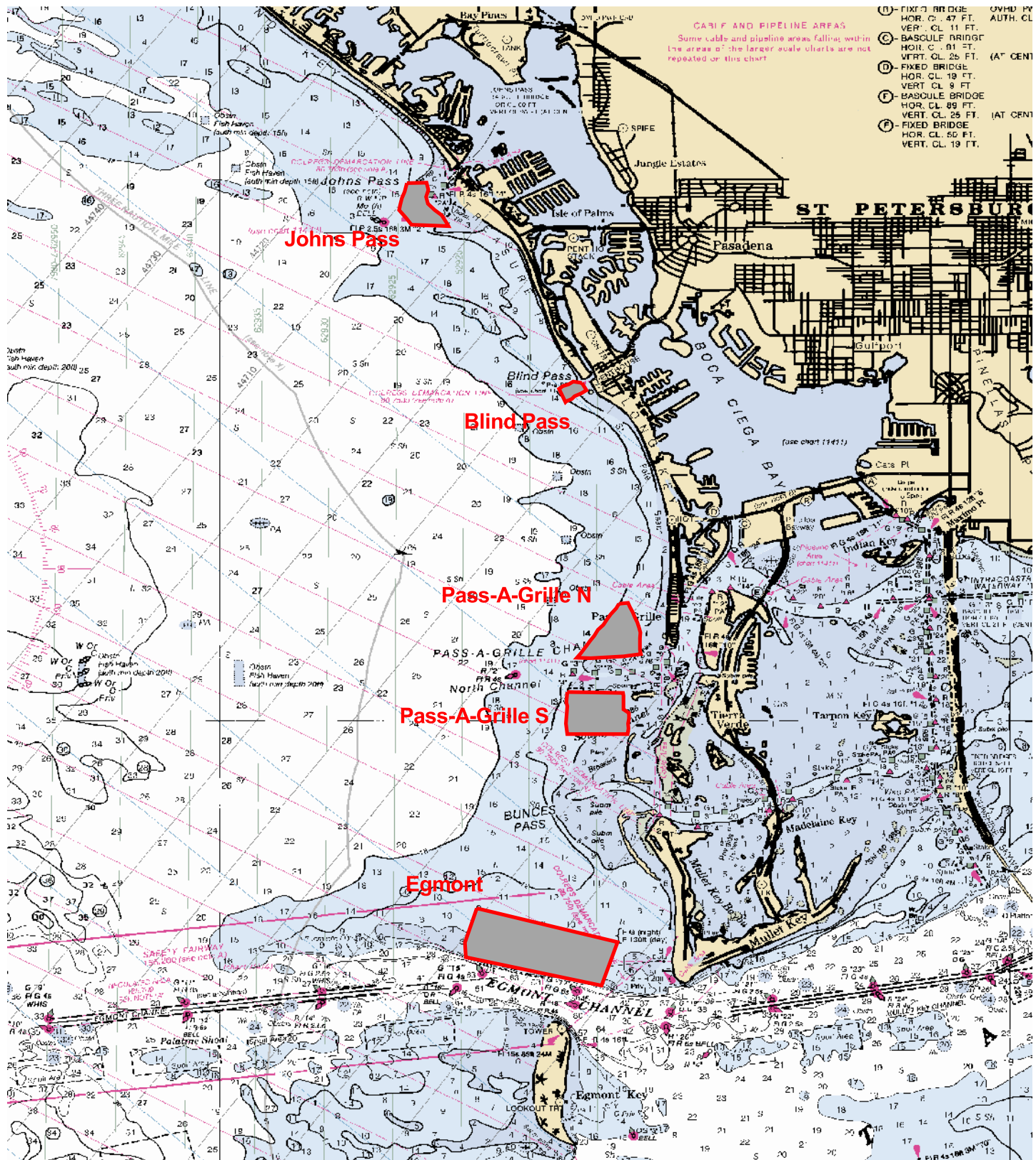



 Pinellas County Marine Biological Survey Areas

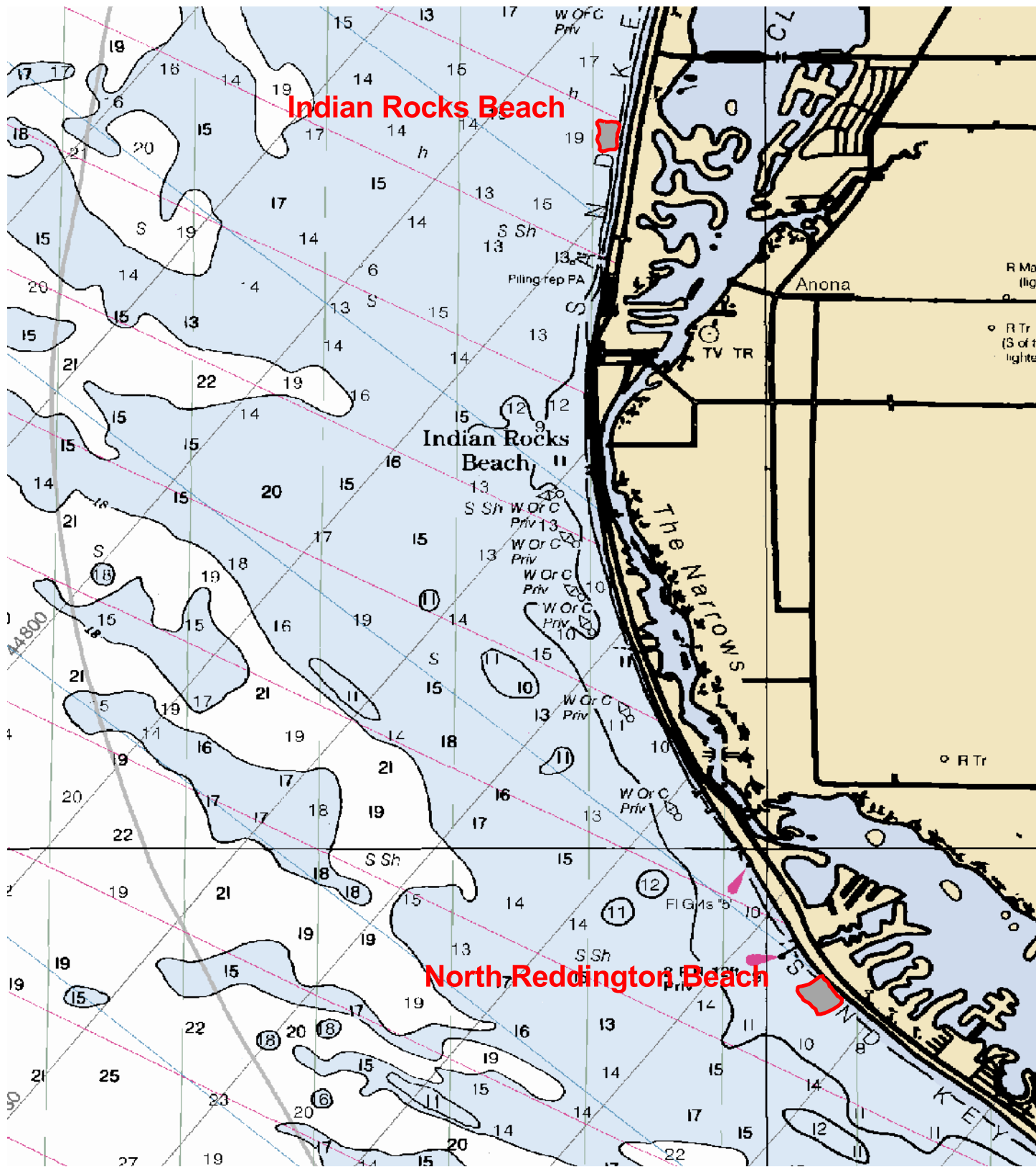



Location Map	
Preliminary Draft Marine Biological Survey Pinellas County SPP	
Scale: 1" = 5 miles	Drawn By: MR
Date: December, 2001	
 DIAL CORDY AND ASSOCIATES INC Environmental Consultants	J01-493
	Figure 1





Ebb Tidal Shoal Borrow Areas	
Preliminary Draft Marine Biological Survey Pinellas County SPP	
Scale: 1" = 2 miles	Drawn By: MR
Date: December, 2001	
 DIAL CORDY AND ASSOCIATES INC. Environmental Consultants	J01-493
	Figure 3



Nearshore Breakwater Areas	
Preliminary Draft Marine Biological Survey Pinellas County SPP	
Scale: 1" = 1 mile	Drawn By: MR
Date: December, 2001	
 DIAL CORDY AND ASSOCIATES INC Environmental Consultants	J01-493
	Figure 4

2.0 TECHINICAL APPROACH

DC&A conducted field investigations to locate, delineate, and characterize existing hardground and/or other benthic community resources within the proposed borrow areas. Marine resources were mapped and documented with underwater still and video photography. The field survey was conducted during July-September 2001.

This purpose of this survey was to verify and groundtruth existing side-scan records (SeaSystems 1996). Prior side-scan mapping showed extensive areas of consolidated material within each of the proposed borrow areas (2,309 acres). This survey was used to map and characterize the extent of marine resources in relation to the previous side-scan survey. The accompanying CD-ROM provides a comparison of the hardbottom coverage verified by this survey to the previous side-scan effort. An additional 1,519.6 acres (3,828.6 acres total) of live-bottom habitats were identified and mapped within this study.

2.1 Towed Video Survey and Mapping

To identify and delineate any marine resources present within the proposed borrow areas, a towed video survey was conducted. A towed video camera, in conjunction with Differential Global Positioning System (DGPS) and HYPACKMAXTM navigation software, was utilized. Real time position of the camera was overlaid on the digitally recorded survey record. Transects were established within each borrow area at 500-foot intervals. In total, over 350 nautical miles of transect lines encompassing over 13,800 acres were surveyed (Figures 5-11).

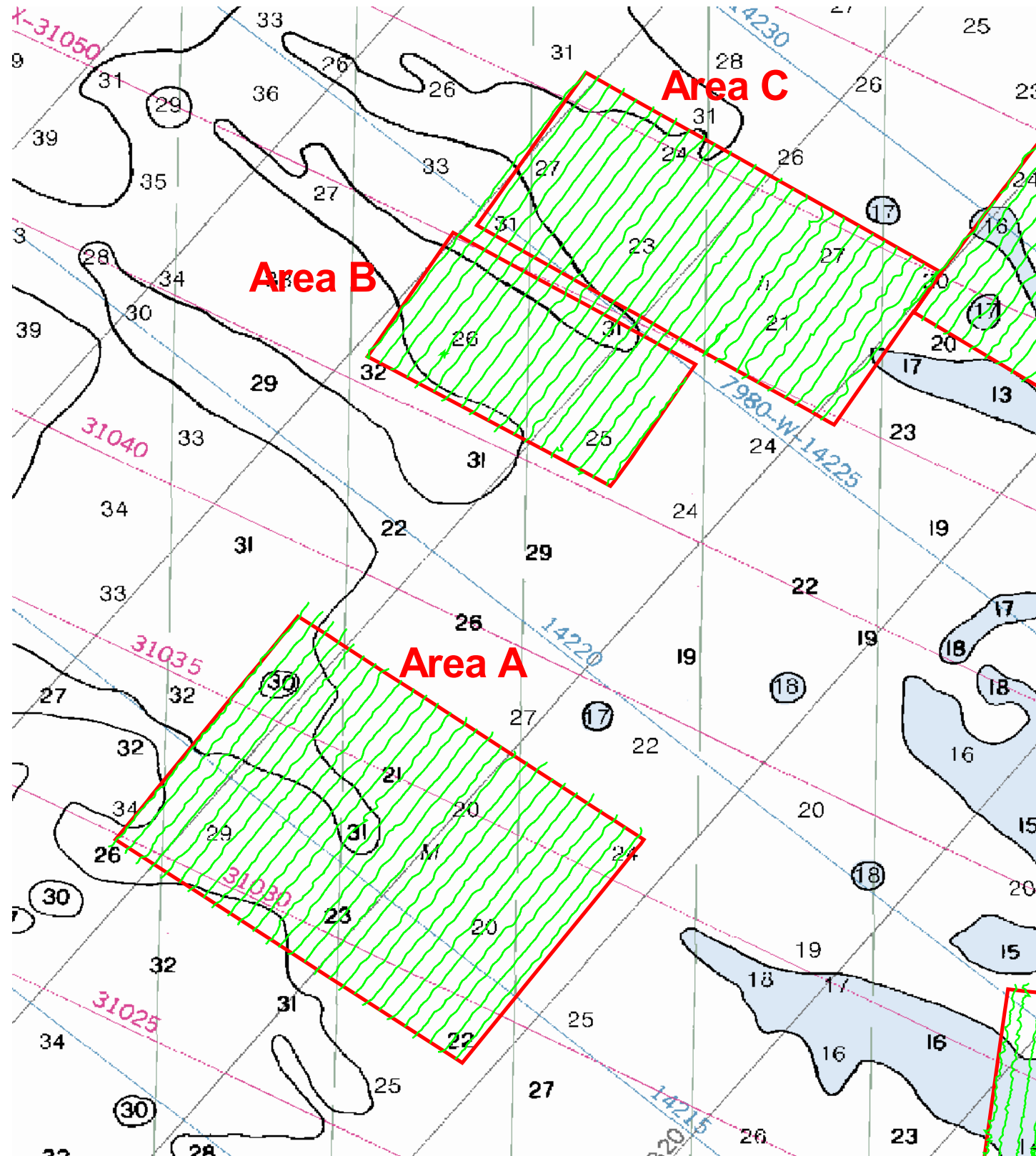
The point at which each transect crossed a change in marine habitat (i.e. hardbottom, sand, etc.) was determined from video analysis. The points were then incorporated into a database and ArcView GISTM was used to generate resource maps. Hardbottom was classified by percent of coverage and also vertical relief. Hardbottom classifications are shown in Tables 1 and 2.

Table 1 Hardbottom Coverage Classifications Used to Map Marine Resources

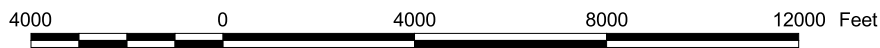
Classification	Percent Coverage
Patchy	< 20% coverage
Scattered	20-75% coverage
Dense	>75% coverage


Table 2 Hardbottom Relief Classifications Used to Map Marine Resources

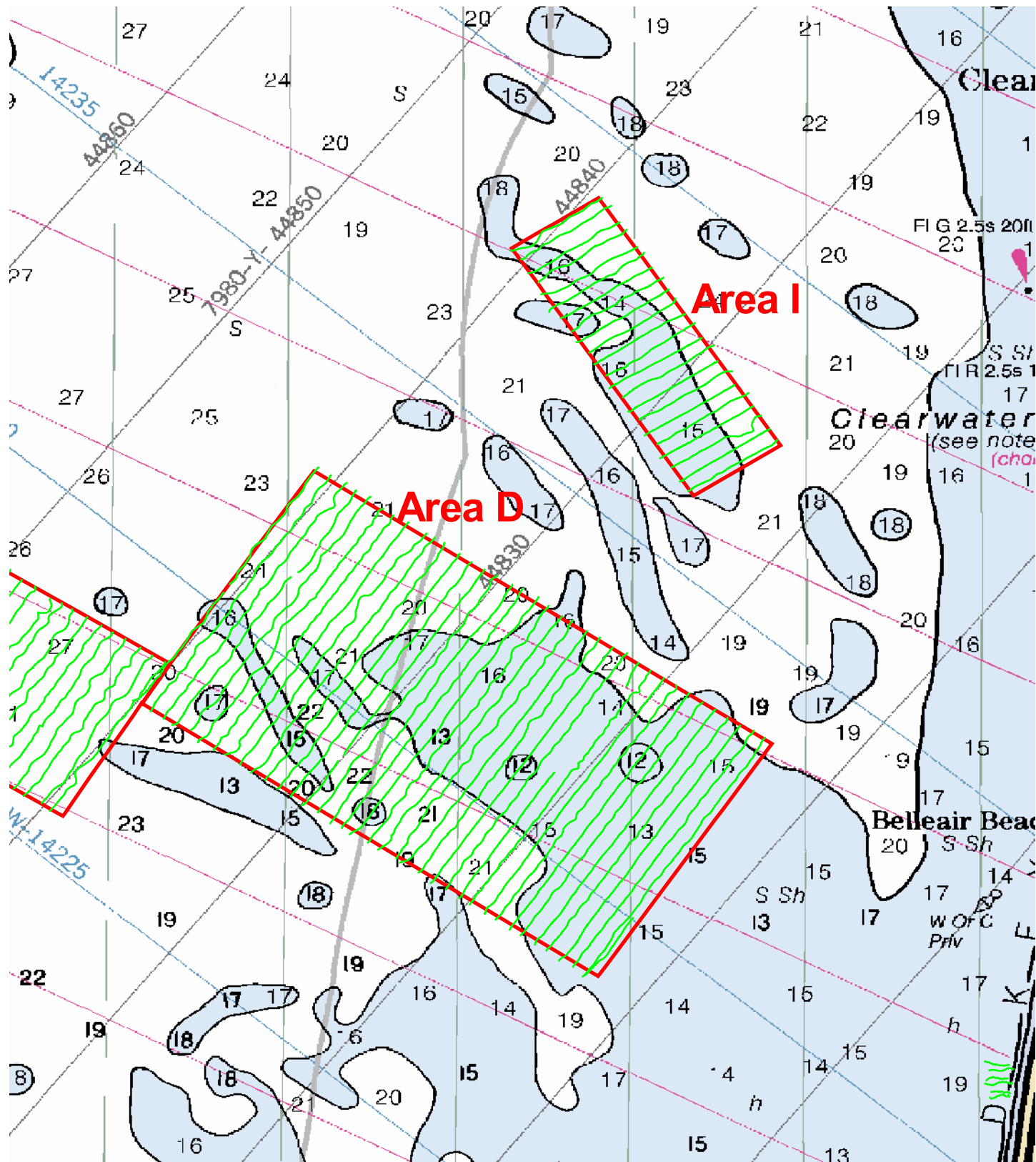
Classification	Relief (cm)
Low Relief	<30 cm
Medium Relief	30-100 cm
High Relief	>100 cm



 Transect Survey Lines
 Offshore Borrow Areas



Borrow Areas "A", "B", and "C" Transect Survey Lines	
Preliminary Draft Marine Biological Survey Pinellas County SPP	
Scale: 1" = 4,000'	Drawn By: MR
Date: December, 2001	
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	Figure 5



 **Transect Survey Lines**
 **Offshore Borrow Areas**



Borrow Areas "D" and "I" Transect Survey Lines

Preliminary Draft Marine Biological Survey
 Pinellas County SPP

Scale: 1" = 4,000'

Date: December, 2001

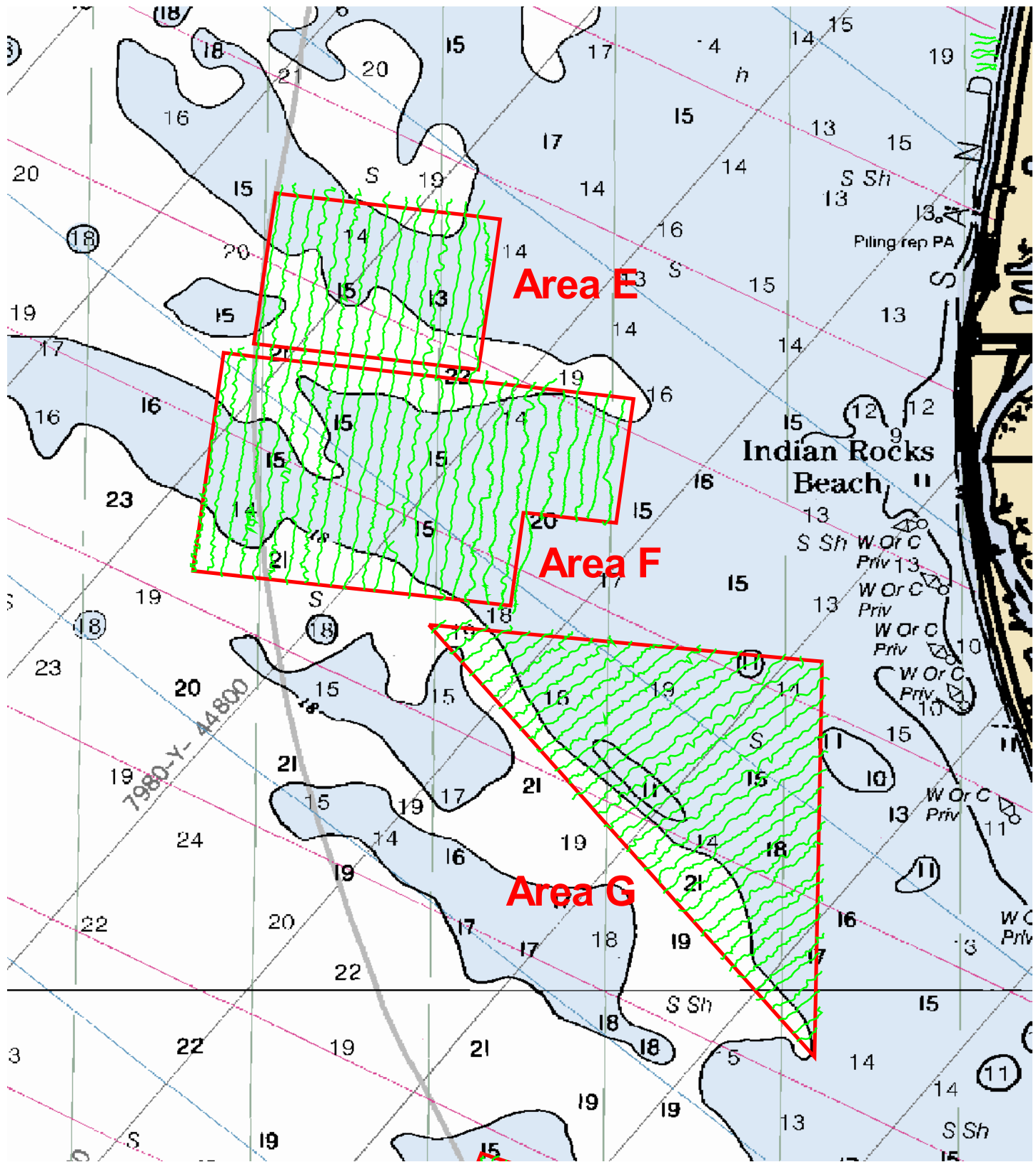
Drawn By: MR



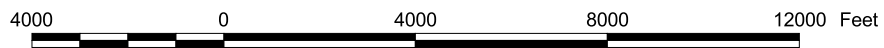
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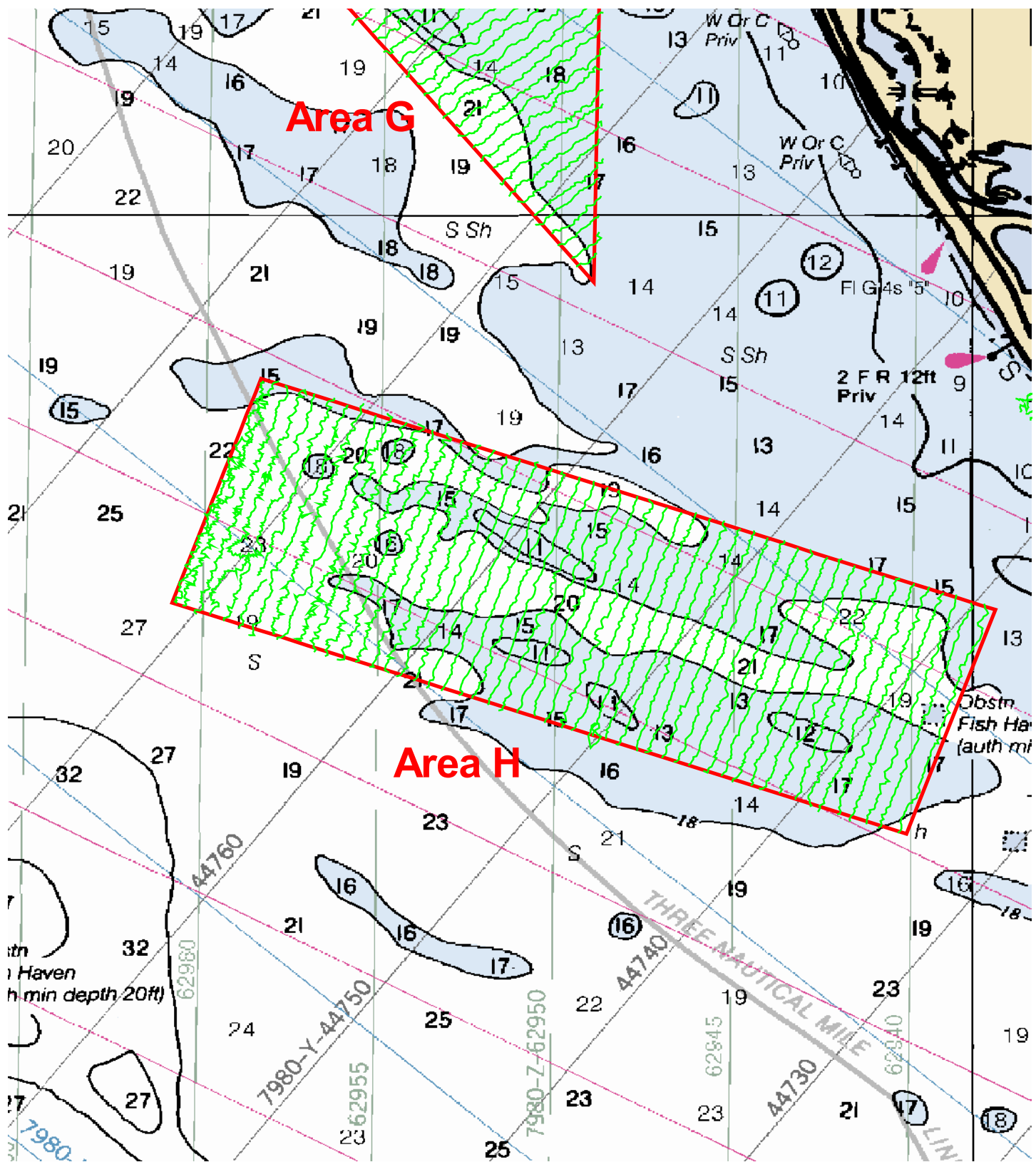
Figure 6



 **Transect Survey Lines**
 **Offshore Borrow Areas**



Borrow Areas "E", "F", and "G" Transect Survey Lines	
Preliminary Draft Marine Biological Survey Pinellas County SPP	
Scale: 1" = 4,000'	Drawn By: MR
Date: December, 2001	
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	Figure 7



 Transect Survey Lines
 Offshore Borrow Areas



4000 0 4000 8000 12000 Feet

Borrow Area "H" Transect Survey Lines

Preliminary Draft Marine Biological Survey
 Pinellas County SPP

Scale: 1" = 4,000'

Drawn By: MR

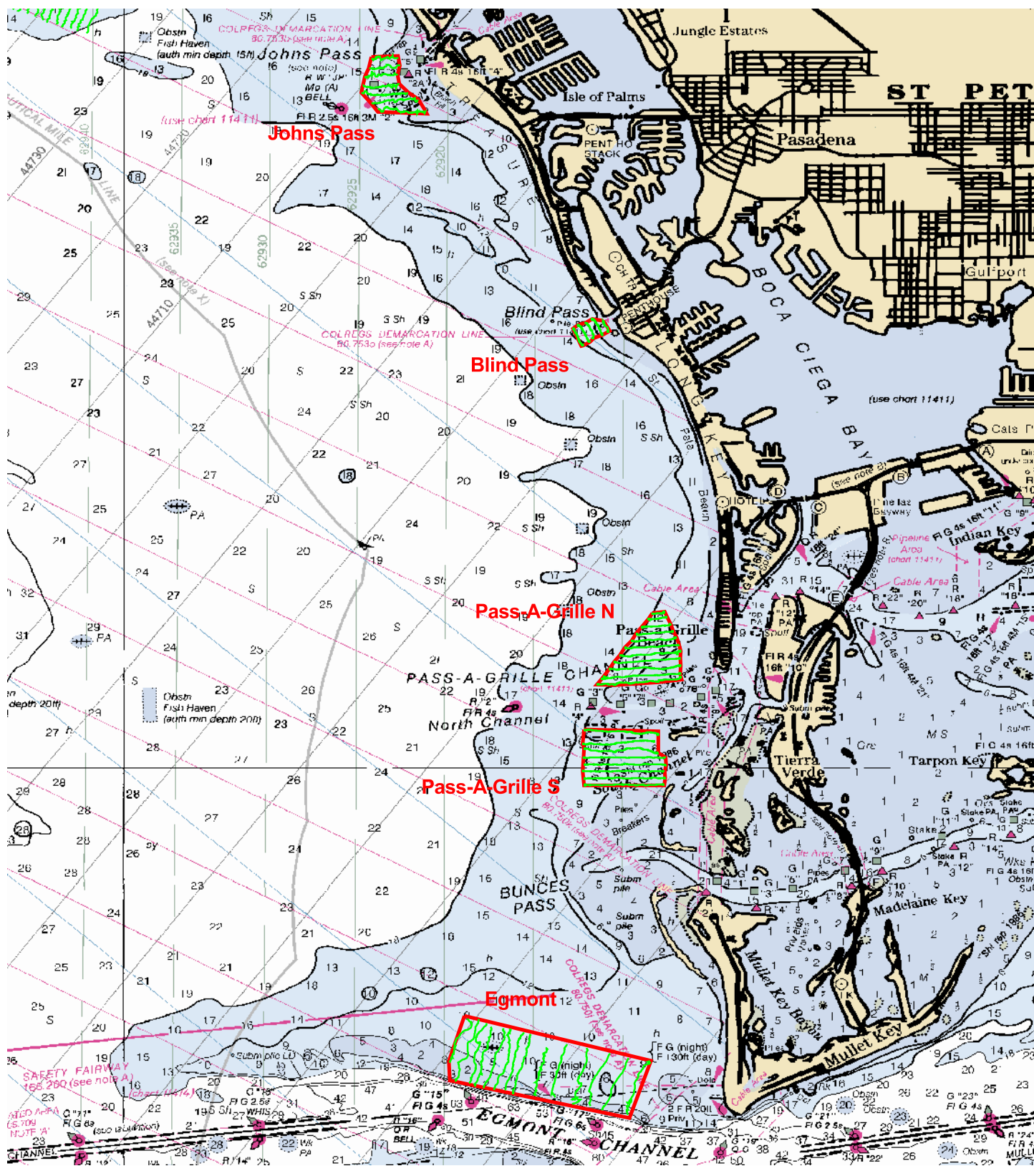
Date: December, 2001



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Figure 8



Transect Survey Lines



Ebb Tidal Shoals Areas



8000 0 8000 16000 Feet

Ebb Tidal Shoal Transect Survey Lines

**Preliminary Draft Marine Biological Survey
Pinellas County SPP**

Scale: 1" = 8,000'

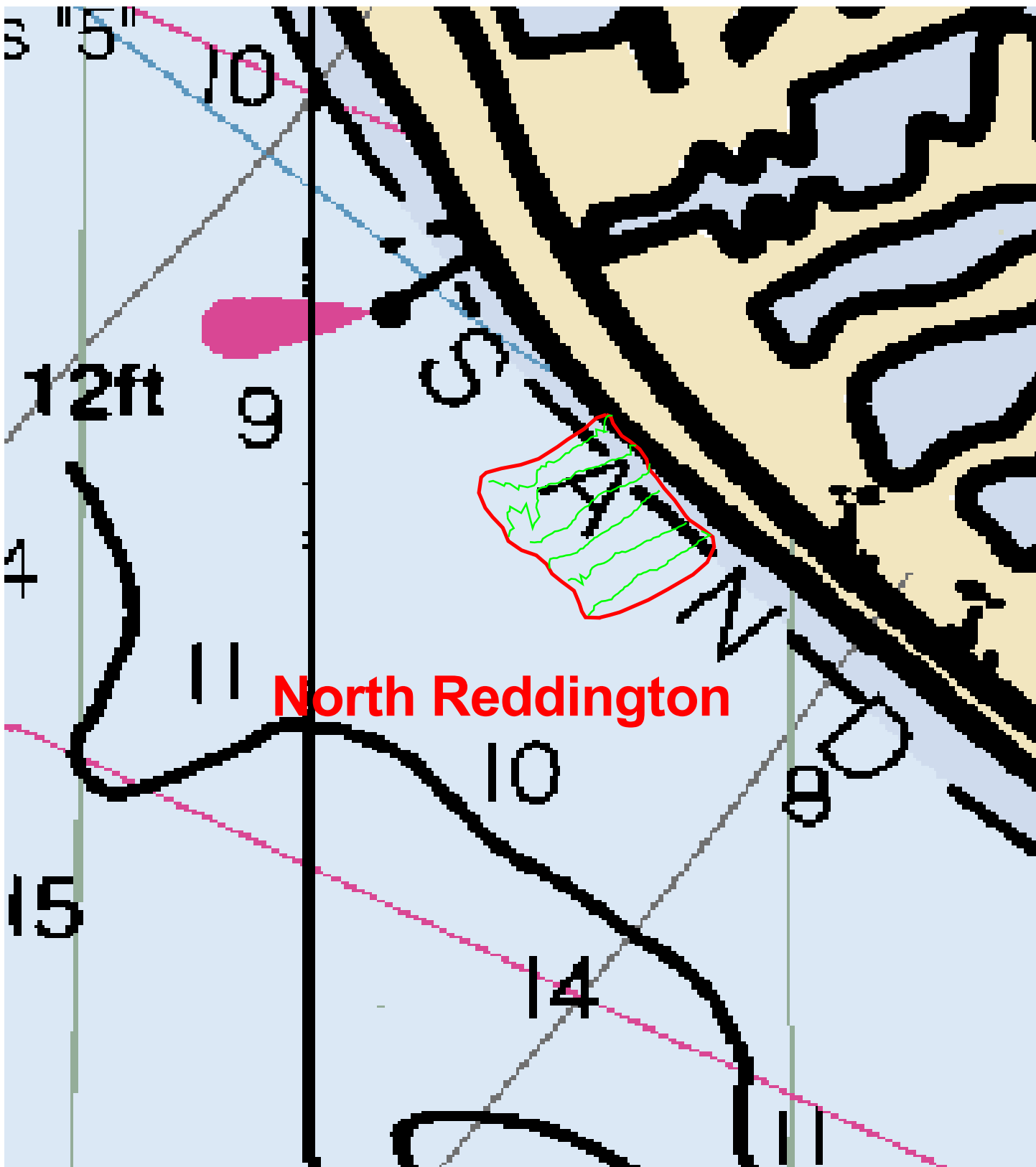
Drawn By: MR

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Figure 9



North Reddington

 Transect Survey Lines
 Breakwater Area



1000 0 1000 2000 Feet

North Reddington Transect Survey Lines

Preliminary Draft Marine Biological Survey
 Pinellas County SPP

Scale: 1" = 1,000'

Drawn By: MR

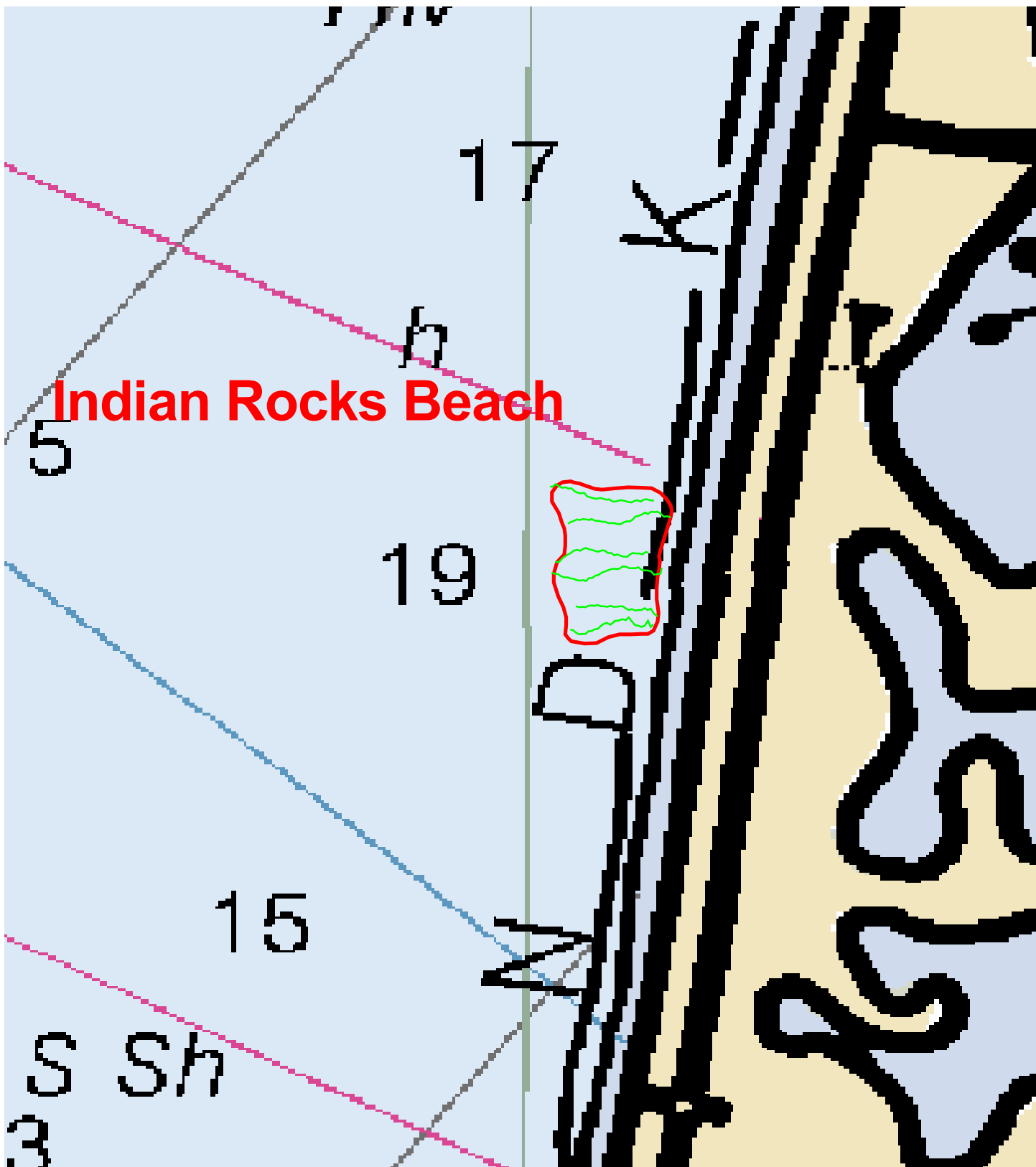
Date: December, 2001



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Figure 10



 Transect Survey Lines
 Breakwater Area



1000 0 1000 2000 Feet

Indian Rocks Beach Transect Survey Lines

Preliminary Draft Marine Biological Survey
Pinellas County SPP

Scale: 1" = 1,000'

Drawn By: MR

Date: December, 2001



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Figure 11

2.2 Diver Survey and Characterization

In addition to the towed video survey, diver characterizations of existing habitats were also conducted. Representative habitat types, as determined from video analysis, were located and divers deployed to document the dominant invertebrate, fish, marine algae, and coral communities present within each of the nine borrow areas. Still photographs and hand held video were also used to document the type and extent of living cover, as well as vertical relief and overall quality within these areas.

All diving operations conformed to the requirements of the U.S. Army Corps of Engineers Safety and Health Manual EM 386-1-1, September 3, 1996, OSHA, 29 CFR, Subpart T, and ACOE, Jacksonville District, Safety and Occupational Health Program. Personnel accepted by the District Diving Coordinator (DDC) and approved in the dive plan submitted prior to the field survey performed all diving operations.

3.0 MARINE RESOURCE CHARACTERIZATION

This section summarizes the results of the comprehensive survey conducted as well as a review of pertinent literature.

3.1 Overview of Marine Resources

The area surveyed included areas offshore of Pinellas County, FL. These potential borrow areas exist in water depths from seven to ten meters. Lyons and Collard (1974) describe these communities as areas of moderate wave energy with quartz sand and shell fragment sediments extending offshore. Large temperate mollusks and echinoderms tend to be the dominant faunal elements. In areas over 10 meters in depth, exposed rock substrate allows for the establishment of scleractinian, molluscan, crustacean, tunicates, and other species more common to shallower waters of south Florida (Smith 1974, Lyons and Collard 1974). Quartz sands, with biologically influenced carbonates present, also dominate the sediments within this area.

3.1.1 Marine Algae

The marine algae present within the areas offshore of Pinellas County are extremely diverse. Phillips et al. (1960) identified ninety-five taxa of algae within areas of similar depth in this area. Dominant algal species observed during this and other studies includes *Caulerpa* sp., *Halimeda* sp., *Udotea flabellum*, *Sargassum* sp., and *Rhipocephalus phoenix* (Phillips et al. 1960, EPA 1981, CZR 1991).

3.1.2 Invertebrates

Benthic invertebrates associated with live bottom habitats along the eastern Gulf of Mexico include scleractinian, molluscan, crustacean, tunicates, octocoral, echinoderm, and porifera species. Many of these species are similar to species found in the more tropical waters of the Caribbean and south Florida reef tract. Lyons and Collard (1974) characterize the shallow shelf habitat offshore of Pinellas County as an area with sediments dominated by quartz sand and biogenically derived carbonates with exposed rock substrate. This substrate provides habitat for scleractinian, molluscan, crustacean and other invertebrate species.

Previous studies have identified species common to habitats offshore of Pinellas County (EPA 1981; CZR 1991; Child 1992; Posey et al. 1996). The species listed in these previous studies compares closely to species observed during this survey (Table 3). In total over 40 dominant invertebrate species were observed from the diver and video surveys. There are many more cryptic and less obvious species present within these complex habitats.

Table 3 Dominant Invertebrate Species Observed During Borrow Area Surveys

Scientific Name	Common Name
Echinoderms	
<i>Linckia guildingii</i>	Common Comet Star
<i>Astropecten articulatus</i>	Beaded Sea Star
<i>Echinaster spinulosus</i>	Orange-Ridged Sea Star
<i>Luidia clathrata</i>	Striped Sea Star
<i>Luidia sp.</i>	Sea Star
<i>Luidia alternata</i>	Banded Sea Star
<i>Echinometra lucunter</i>	Rock-boring Urchin
<i>Lytechinus variegatus</i>	Variegated Urchin
Mollusks	
<i>Pinna carnea</i>	Penshell
<i>Charonia variegata</i>	Tritons Trumpet
<i>Busycon contrarium</i>	Lightning Whelk
<i>Pleuroploca gigantea</i>	Florida Horse Conch
Scleractin Corals	
<i>Cladocora arbuscula</i>	Tube Coral
<i>Stephanocoenia mitchellii</i>	Blushing Star Coral
<i>Isophyllia sinuosa</i>	Cactus Coral
<i>Siderastrea sp.</i>	Starlet Coral
<i>Solenastrea hyades</i>	Knobby Star Coral
<i>Scolymia lacera</i>	Mushroom Coral
<i>Phyllangia americana</i>	Hidden Cup Coral
<i>Manicina aereolata</i>	Rose Coral
<i>Montastrea annularis</i>	Boulder Star Coral
<i>Oculina robusta</i>	Robust Ivory Tree Coral
<i>Millepora alcicornis</i>	Branching Fire Coral
Octocorals	
<i>Eunicea succinea</i>	Shelf-knob Sea rod
<i>Eunicea calyculata</i>	Warty Sea Rod
<i>Plexaurella nutans</i>	Giant Slit-Pore Sea Rod
<i>Muricea laxa</i>	Delicate Spiny Sea Rod
<i>Muricea elongata</i>	Orange Spiny Sea Rod
<i>Pseudoterogorgia sp.</i>	Sea Plume
<i>Pterogorgia citrina</i>	Yellow Sea Whip
<i>Leptogorgia virgulata</i>	Colorful Sea Whip
Sponges	
<i>Cribrochalina vasculum</i>	Brown Bowl Sponge
<i>Xestospongia muta</i>	Giant Barrel Sponge
<i>Spheciospongia vesparium</i>	Loggerhead Sponge
<i>Ircinia sp.</i>	Ball Sponge
<i>Calyx podatypa</i>	Dark Volcano Sponge
<i>Anthosigmella varians</i>	Brown Variable Sponge
<i>Amphimedon compressa</i>	Erect Rope Sponge
<i>Pseudoceratina crassa</i>	Branching Tube Sponge
Crustaceans	
<i>Menippe mercenaria</i>	Florida Stone Crab
Tunicates	
<i>Clavelina sp.</i>	Colonial tunicates
Family Didemnidae	Overgrowing Tunicates
<i>Eudistoma sp.</i>	Condominium Tunicate

The most obvious feature of the hardbottom habitats in the eastern Gulf of Mexico include the octocorals, sponges, and scleractinian corals. Eight species of octocoral were observed (e.g. *Eunicea succinea*, *Eunicea calyculata*, *Pterogorgia citrina* etc.), as well as, eleven species of scleractinian (hard) corals (e.g. *Cladocora arbuscula*, *Solenastrea hyades*, etc.) (Table 3). Poriferian species are also one of the dominant phyla present within the hardbottom habitats. Eight species of sponges were identified within the study area and of these the loggerhead (*Spheciospongia vesparium*) and barrel sponges (*Xestospongia muta*) were the most obvious. Other sponges common to these hardbottom habitats included *Ircinia* sp., *Cribrochalina vasculum*, and *Anthosigmella varians*.

Typical epifaunal species observed during this survey included *Astropecten articulatus*, *Luidia clathrata*, *Busycon contrarium*, and *Pleuroploca gigantea*. CZR (1991) and EPA (1981) also found these species to be some of the most common encountered. Sediments within the area consist of sand to shelly sand that support benthic invertebrate communities. In the EPA (1981) study, dominant species in these habitats included sand dollars (*Encope emarginata*), *Luidia* sp., and *Enchinocardium cordatum*. Similar species were observed during this study. Benthic sampling conducted during past surveys also shows that polychaetes, oligochaetes, pycnogonids, bivalves, and arthropods are the dominant taxa collected in these habitats (CZR 1991; Child 1992; Posey et al. 1996).

3.1.3 Fishes

Fishes off of the Pinellas County coast are comprised of both reef and pelagic species. Many of the species present within this area are of commercial importance and addressed under the National Marine Fisheries Service (NMFS) Gulf of Mexico Fishery Management Council (GMFMC) Management Plan (GMFMC 1998). The fish assemblages in the area offshore of Pinellas County Florida and the Gulf of Mexico have been studied many times in the past. These studies have included reports which characterize the offshore and nearshore assemblages of fishes (Moe and Martin 1965; Saloman and Naughton 1979), cold stress of fishes on reef areas (Gilmore et al. 1978; Bullock et al. 1979), growth and reproduction (Shirripa and Burns 1997; Bullock et al. 1996), and the impacts of fishing activities and predation (Pierce et al. 1998; Nelson and Bortone 1996), as well as many other subjects.

Moe and Martin (1965) collected over 2,300 individual fishes from 41 species during sampling conducted at nine separate locations offshore of Pinellas County. The most common fishes collected during this survey included sand perch (*Diplectrum fromosum*), pigfish (*Orthopristus chrysopterus*), silver perch (*Bairdiella chrysura*), spot (*Leiostomus xanthurus*), and pinfish (*Lagodon rhomboides*). Other species collected in this study included searobins (*Prionotus tribulus crassiceps* and *Prionotus scitulus latifrons*), and three species of flounder (*Etropus rimosus*, *Etropus crossotus atlanticus*, and *Syacium papillosum*).

Fishes of commercial and recreational importance within the eastern Gulf of Mexico include groupers and snappers. These species are included in the GMFMC Snapper-Grouper

Complex fisheries management plan (1998). Species common to the area include yellowedge grouper (*Epinephelus flavolimbatus*) (Bullock et al. 1996), gag (*Mycteroperca microlepis*) and red grouper (*Epinephelus morio*) (Schirripa and Burns 1997). Many of these species have been subjected to overfishing and stocks within the area have declined. This include red porgy (*Pargus pargus*), vermillion snapper (*Rhomboplites aurobens*), and other grouper species (*Epinephelus* sp.) (Roberts et al. 1995).

Pelagic species also occur throughout the Gulf of Mexico in the nearshore and offshore waters. Major coastal pelagic families include Rachycentridae (cobia), Mugilidae (mullet), Pomatomidae (bluefish), Caranagidae (jacks), Scombridae (tunas and mackerels), Engraulidae (anchovies), and Carahahinidae (requiem sharks). Many of these pelagic species form large schools (e.g. jacks, mullet, mackerel, etc.), while others travel singly or in small groups (e.g. cobia). Distribution of these species can vary seasonally and usually depends on water column attributes that vary seasonally.

Fishes observed during diver and video surveys in this study are shown in Table 4. In total 17 species from 15 families were observed. Most species observed included small demersal species common to hardbottom areas. The most common species observed were wrasses (Labridae); in particular the slippery dick (*Halichoeres bivittatus*). Other common fishes included searobins (*Prionotus* sp.), and menhaden (*Brevoortia* sp.). Anecdotal observations of pelagic fishes during the survey included large schools of baitfish (Engraulidae and Clupeidae), sharks (Carahahinidae), mackerel (Scombridae), and a nurse shark (*Ginglymostoma cirratum*).

Table 4 Fishes Observed Within Borrow Area During Diving Surveys

Scientific Name	Common Name
<i>Haemulon</i> sp.	Juv. Grunt
<i>Equetus umbrosus</i>	Juv. Highhat
<i>Synodus intermedius</i>	Sand Diver
<i>Opsanus beta</i>	Toadfish
<i>Monocanthus</i> sp.	Filefish
<i>Halichoeres bivittatus</i>	Slippery Dick
<i>Diplectrum fromosum</i>	Sand Perch
<i>Archosargus probatocephalus</i>	Sheepshead
<i>Calamus</i> sp.	Porgy
<i>Parablennius marmoreus</i>	Seaweed Blenny
<i>Diplodus holbrooki</i>	Spotfin Pinfish
<i>Brevoortia</i> sp.	Menhaden
<i>Prionotus</i> sp.	Sea Robin
<i>Echeneis naucratis</i>	Sharksucker
<i>Centropristis striata</i>	Black Sea Bass
<i>Gymnothorax saxicola</i>	Honeycomb Moray
<i>Serranus subligarius</i>	Belted Sandfish

3.1.4 Other Vertebrates

Other vertebrate species, which utilize these offshore habitats, include many threatened and endangered species. The Gulf of Mexico is within the range of five species of sea turtle, the West Indian manatee (*Trichechus manatus*), and up to 28 cetacean species. Of these, four species of sea turtle, the manatee, and one cetacean, the bottlenose dolphin (*Tursiops truncatus*) occur within the study area.

3.1.4.1 Sea Turtles

Four species of sea turtle commonly occur within the area around Pinellas County (Meylan et al. 1999; EPA 1981). These are the loggerhead (*Caretta caretta*), green (*Chelonia mydas*), Kemp's ridley (*Lepidochelys kempii*), and the hawksbill (*Eretmochelys imbricata*). The loggerhead is listed as threatened and the other three species are listed as endangered. Loggerhead turtles represent most of the sea turtles present in the Tampa Bay area. Data collected on sea turtle nesting in the area shows that the majority of the nests within this area consist of loggerhead nests (Table 5). Of the 279 nests observed on Pinellas County beaches in 2000, 278 were loggerhead nests. The only other nesting activity reported was one green turtle nest. All turtles observed during this survey were loggerhead turtles which were seen with regular consistency while conducting the survey. Stranding records within the Pinellas County area also confirmed that loggerhead turtles are the most numerous species. During this survey a dead loggerhead was discovered and reported to the FMRI stranding network.

Table 5 Summary of Loggerhead Sea Turtle Nesting from 1988-2000

Year	Beach Length Surveyed	Number of Nests
1988	69.5	56
1989	63.2	92
1990	62.1	144
1991	67.3	175
1992	63.3	142
1993	42.7	105
1994	52.6	138
1995	58.8	229
1996	49.1	223
1997	58.8	181
1998	52.3	233
1999	62.6	172
2000	62.6	279

Source: Florida Marine Research Institute 2001

3.1.4.2 Marine Mammals

Marine mammals commonly present within the waters nearshore and offshore the study area include manatee and bottlenose dolphin. Bottlenose dolphins were commonly observed while conducting this survey. As many as 15 dolphins were observed at one time in the areas adjacent to the offshore borrow areas. Weigle (1990) documented that at least three distinct herds of dolphin are common within the Lower Tampa Bay area. This includes as many as 246 individual animals. Many of the dolphins observed may have been transient in nature. However, 75 individuals were observed on more than one occasion.

West Indian manatees also utilize habitats within the study area. Manatees inhabit both fresh and saltwater and may be encountered in canals, rivers, estuaries, bays, and on occasion have been observed as far as 6 km off the Florida Gulf coast (USFWS, 1996). Aerial surveys indicate that as many as 190 manatees may use Tampa Bay (Ackerman, 1995). Surveys show that over 900 manatees inhabit the west coast of Florida. The highest concentrations of manatees along Florida's Gulf coast exists in Citrus, Levy, Lee, and Collier Counties. Data suggest that of the manatees living in the Tampa Bay area, most occur within the bay where water temperatures are more stable year round. During aerial surveys in 1992, only 15 manatees were surveyed in the eastern portion of Tampa Bay (Ackerman, 1995). Examination of the manatee mortality data for Pinellas and Hillsborough Counties shows that from January 2000-October 2001 a total of 27 manatee deaths were reported. The majority of these deaths involved perinatal, cold stress, or other natural causes.

3.2 Offshore Borrow Areas

In total, nine offshore borrow areas were surveyed. These nine areas entail a total area of 13,829 acres. Within these areas, over 75 percent of the habitat surveyed was open sand (10,000.4 acres) while the remaining 3,828.6 acres consisted of hardbottom habitats.

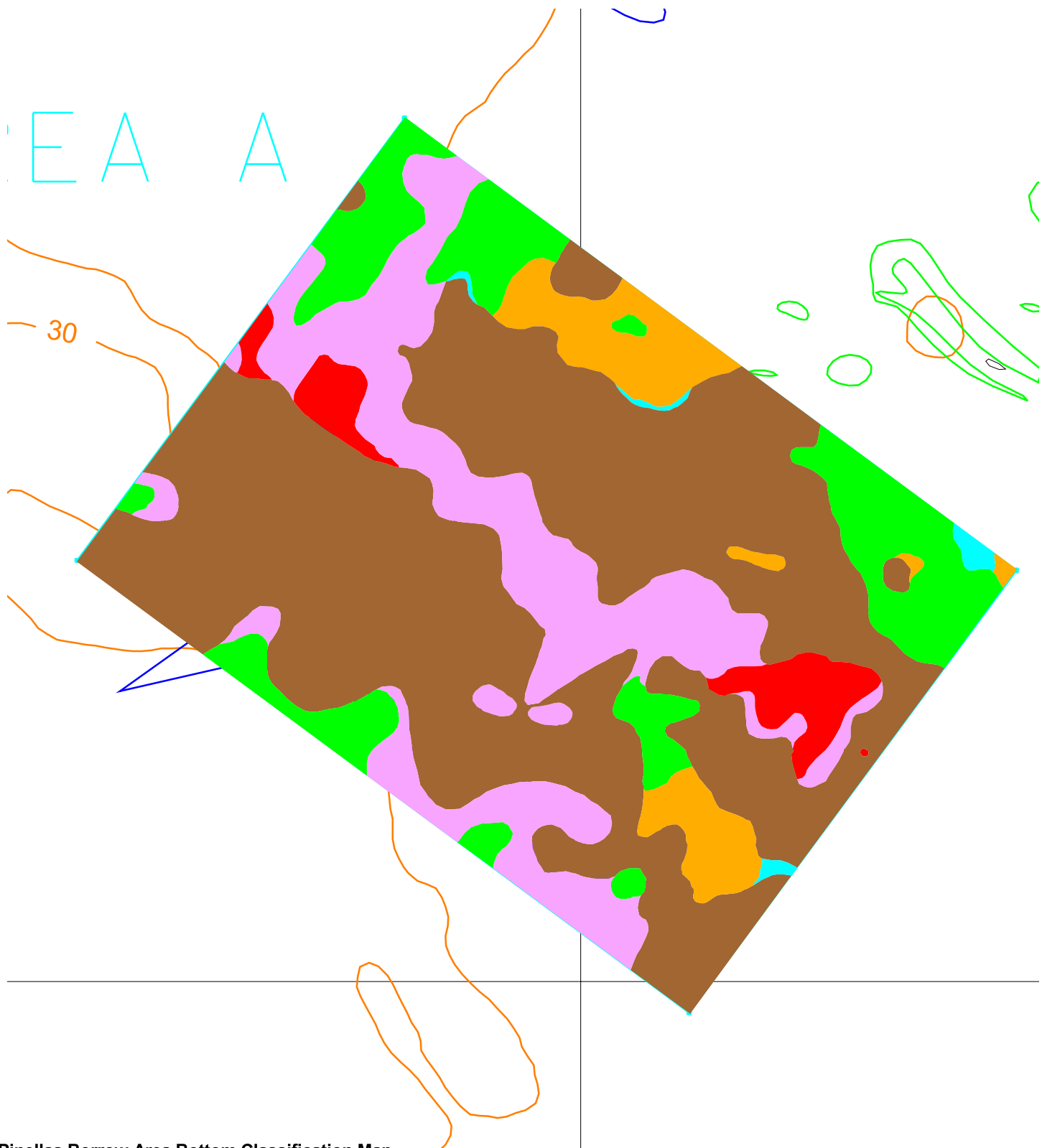
3.2.1 Area A

Offshore Borrow Area A lies six miles offshore of Indian Rocks Beach, Florida. Borrow Area A encompasses 2,030 acres in approximately 25 feet of water. Of these 2,030 acres, 1,153 acres are sand, while 877 acres of area is exposed hardbottom habitat (Figure 12).

3.2.1.1 Habitat Description

Borrow Area A has the most exposed hardbottom areas of all of the areas mapped. Most of the 880 acres of hardbottom within Area A consists of scattered medium relief habitats. In total 390 acres of the hardbottom habitat is scattered medium relief hardbottom, 126 acres of

AREA A




Pinellas Borrow Area Bottom Classification Map

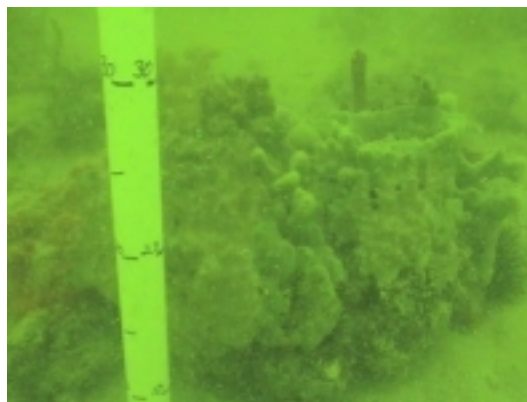
- Dense Hardbottom (>75% Cover), High Relief (>100 cm)
- Dense Hardbottom (>75% Cover), Medium Relief (30cm-100cm)
- Scattered Hardbottom (20% - 75% Cover), Medium Relief (30cm-100cm)
- Scattered Hardbottom (20% - 75%, Cover), Low Relief (<30cm)
- Patchy Hardbottom (<20% Cover), Low Relief (<30cm)
- Sand

2000 0 2000 4000 Feet



Borrow Area "A" Marine Resource Map	
Preliminary Draft Marine Biological Survey Pinellas County SPP	
Scale: 1" = 2,000'	Drawn By: MR
Date: December, 2001	
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	Figure 12

scattered low relief hardbottom, with the remaining 249 acres being dense medium/high relief habitat (Table 6). Relief within Area A averages 32 cm and is predominately low-lying sponges, gorgonians, and hard corals. Photograph 1 shows a typical area of exposed hardbottom with relief. Hardbottom in Area A is dominated by gorgonian and sponge species. In particular, *Muricea* sp., and *Pseudopterogonia* sp. tended to be dominant. *Echinometra lucunter* and *Luidia* sp. were the most common motile invertebrates encountered. Overall, hardbottom habitats within Area A tended to be of medium quality. In areas that diver surveys were conducted there tended to be a high degree of siltation present with many corals and sponges slightly covered. Gorgonian species, with a higher relief when compared to the low lying rock, tended to be the healthiest species present. Fish species encountered within Area A included *Equetus umbrosus* and *Opsanus beta*.



Photograph 1. Area A scattered medium relief hardbottom.

3.2.2 Borrow Area B

Borrow Area B is a 703.8 acre block located 5.6 nautical miles offshore of Bellair Beach, FL. Figure 6 shows the relative layout of sand and exposed hardbottom. Within Area B there are 210.3 acres of hardbottom compared to 493.5 acres of open sand habitat.

3.2.2.1 Habitat Description

Hardbottom habitats within Area B consist of predominately low relief features (Figure 13). Dense medium relief hardbottom was the dominant cover type, occupying over 154 acres. Some areas had small ledge features that had vertical relief in excess of 50 cm. Algae, sponges, and tunicates dominated exposed rock cover within Area B. In particular, *Udotea*

Table 6 Summary of Marine Resource Cover Types Within Each Area Surveyed

Survey Area	Acres						
	Total Size	Sand	Patchy Low Relief	Scattered Low Relief	Scattered Medium Relief	Dense Medium Relief	Dense High Relief
Area A	2,030.0	1,153.9	10.8	126.1	390.2	275.2	74.7
Area B	703.8	493.5	5.1	0.7	41.6	154.2	9.1
Area C	1,363.7	1,055.7	5.6	142.3	12.4	82.8	10.4
Area D	2,653.7	1,819.2	8.4	47.7	236.8	529.6	---
Area E	592.7	390.9	30.8	3.6	131.3	12.3	23.8
Area F	1,410.5	1,095.6	27.6	16.5	82.3	21.8	166.8
Area G	1,344.4	1,142.5	---	15.8	97.5	15.9	72.7
Area H	3,202.1	2,533.8	59.0	89.7	353.0	119.5	47.3
Area I	527.3	315.3	5.6	---	121.3	85.2	---
John's Pass	152.1	152.1	---	---	---	---	---
Blind Pass	38.5	38.5	---	---	---	---	---
Pass-a-grille North	249.5	249.5	---	---	---	---	---
Pass-a-grille South	298.0	298.0	---	---	---	---	---
Egmont Channel	831.9	831.9	---	---	---	---	---
North Reddington Beach Breakwater	28.3	23.5	---	---	3.7	---	1.1
Indian Rocks Beach Breakwater	16.3	14.0	---	2.0	---	---	0.3




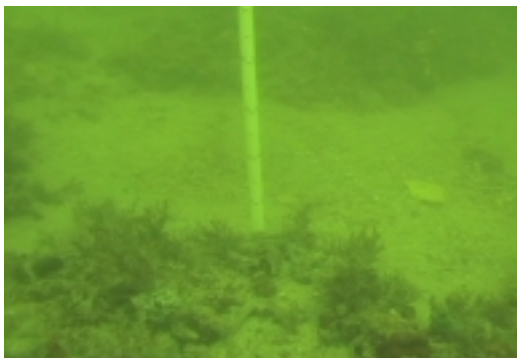
Pinellas Borrow Area Bottom Classification Map

- Dense Hardbottom (>75% Cover), High Relief (>100 cm)
- Dense Hardbottom (>75% Cover), Medium Relief (30cm-100cm)
- Scattered Hardbottom (20% - 75% Cover), Medium Relief (30cm-100cm)
- Scattered Hardbottom (20% - 75%, Cover), Low Relief (<30cm)
- Patchy Hardbottom (<20% Cover), Low Relief (<30cm)
- Sand

1500 0 1500 3000 Feet



Borrow Area "B" Marine Resource Map	
Preliminary Draft Marine Biological Survey Pinellas County SPP	
Scale: 1" = 1,500'	Drawn By: MR
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	Figure 13



flabellum, and *Sargassum* sp. were the most visible algal species. Sponges in the area included *Ircinia* sp. and *Cribrochalina vasculum*. One noticeable feature of the areas where SCUBA reconnaissance was conducted in Area B was the lack of gorgonian species in these hardbottom areas. Invertebrate species common to the area included *Luidia* sp, and the whelk, *Busycon contrarium*. Photograph 2 shows typical hardbottom coverage in Area B with vertical relief shown.

Photograph 2. Area of scattered low relief hardbottom in Area B.

3.2.3 Borrow Area C

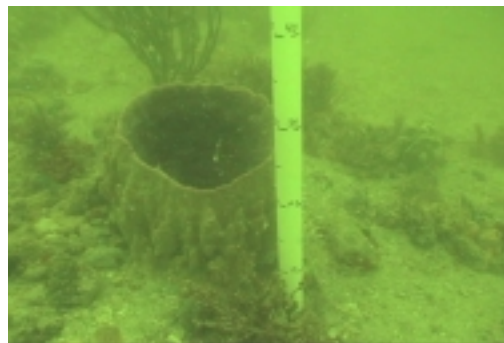
Five miles west of Bellair Beach is Borrow Area C. Area C lies in approximately 20-25 feet of water and has a total area of 1363.7 acres. Within this area, 1,055.7 acres is open sand, while the remaining 308 acres is composed of exposed rock/live bottom habitat (Figure 14).

3.2.3.1 Habitat Description

Dense hardbottom habitats within Area C tended to have a relatively higher quality and diversity in comparison to other offshore areas surveyed. Overall there was a total of 93.2 acrea of dense medium/high relief hardbottom and 154.5 acres of scattered low/medium relief hardbottom in Area C (Table 6). Of particular note within this area, there were colonies of the hard corals *Solenastrea hyades* and *Oculina robusta* and also barrel sponges (*Xestospongia muta*). Fishes were more common in this area with sand divers (*Synodus intermedius*), toadfish, and slipperly dicks along with schools of menhaden (*Brevoortia* sp) and spotfin pinfish (*Diplodus holbrooki*) observed (Photograph 3). Also observed within this area was the commercially important stone crab (*Menippe mercenaria*). Typical relief of hardbottom within Area C was 20 cm (Photograph 4). In some areas, where gorgonian species such as *Pterogorgia anceps* were present, the relief was as high as 40 cm, however.

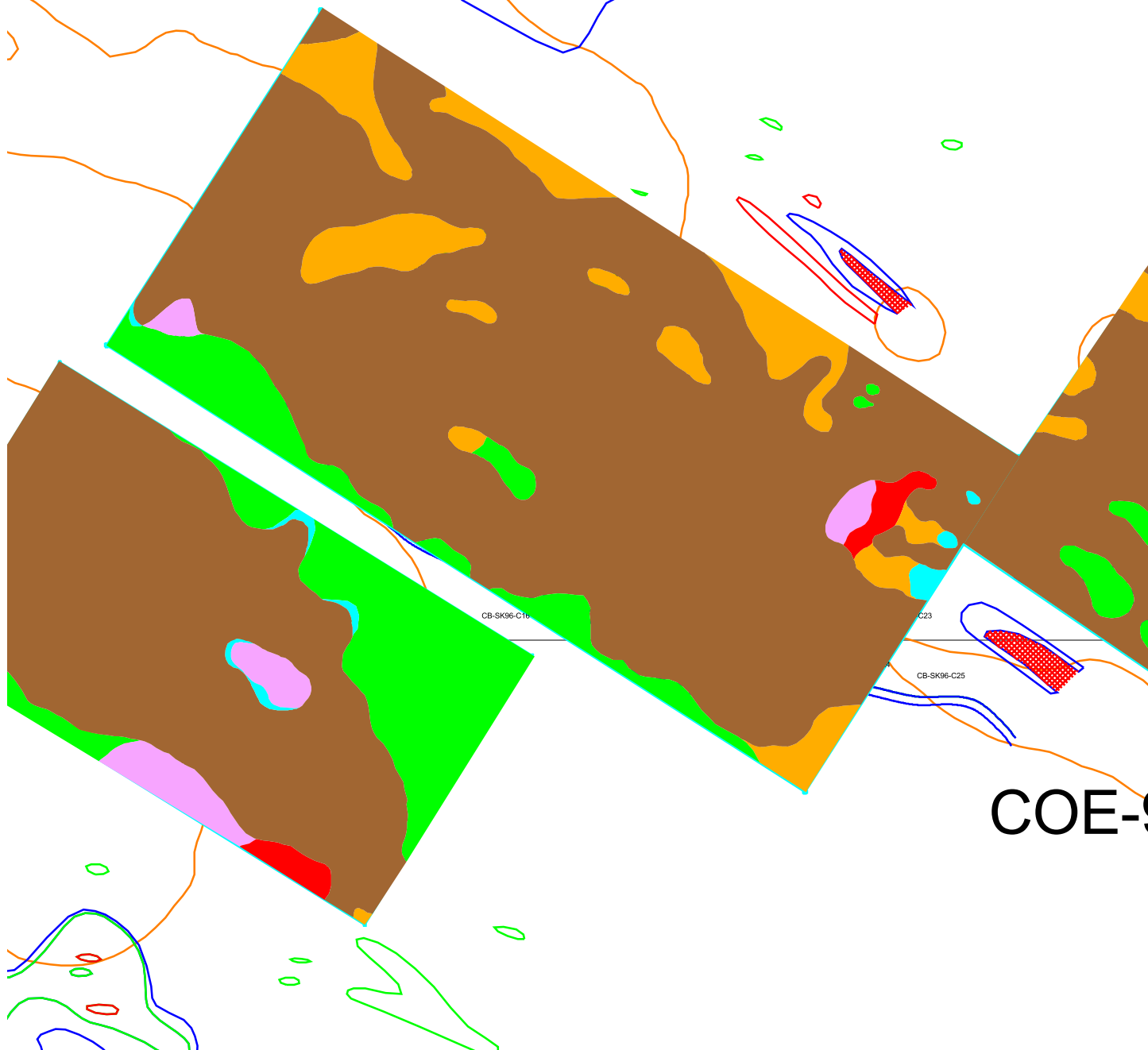


Photograph 3. Sand Diver (*Synodus intermedius*) in Area C.



Photograph 4. Area C Hardbottom with Relief Shown

AREA C




COE-

- Pinellas Borrow Area Bottom Classification Map**
- Dense Hardbottom (>75% Cover), High Relief (>100 cm)
 - Dense Hardbottom (>75% Cover), Medium Relief (30cm-100cm)
 - Scattered Hardbottom (20% - 75% Cover), Medium Relief (30cm-100cm)
 - Scattered Hardbottom (20% - 75%, Cover), Low Relief (<30cm)
 - Patchy Hardbottom (<20% Cover), Low Relief (<30cm)
 - Sand

1500 0 1500 3000 Feet



Borrow Area "C" Marine Resource Map	
Preliminary Draft Marine Biological Survey Pinellas County SPP	
Scale: 1" = 2,000'	Drawn By: MR
Date: December, 2001	
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	Figure 14

3.2.4 Borrow Area D

Borrow Area D lies 2.8 nautical miles offshore of Bellair Beach in the northern portion of the study area (Figure 2). Area D contains 2,653.7 acres of bottom with 1,819.2 acres of sand and 834.5 acres of hardbottom habitats (Figure 15) (Table 6). Area D has the second most available acres of open sand habitat of the nine offshore borrow areas surveyed.

3.2.4.1 Habitat Description



Photograph 5. Large sponges with relief shown in Area D

hardbottom features averaged 36 cm, with 292.9 acres of low/medium relief patchy and scattered habitat. Photograph 6 depicts typical hardbottom features in Area D with relief shown. Fishes were also common in the hardbottom areas within Area D, and included sand divers, juvenile grunts, blennies, and sheepshead (*Archosargus probatocephalus*) were observed within the area. A large sharksucker (*Echeneis naucrates*) was also seen in the area.

Borrow Area D has 529 acres of dense medium relief hardbottom areas dominated by large sponges and gorgonians. Many large sponges such as *Spheciospongia vesparium* and *Cribrochalina vasculum* were present within the area (Photograph 5). In addition there were also some large gorgonian species. These sponges and gorgonians in areas had relief of over 70 cm. Overall within Area D the relief of the



Photograph 6. Typical scattered low relief hardbottom in Area E.

3.2.5 Borrow Area E

Offshore Borrow Area E is the second smallest area surveyed at 592.7 acres (Figure 16). Within this area, the survey revealed 201.8 acres of hardbottom habitat and 390.9 acres of open sand habitat. Borrow Area E is 2.5 miles west of Indian Rocks Beach.




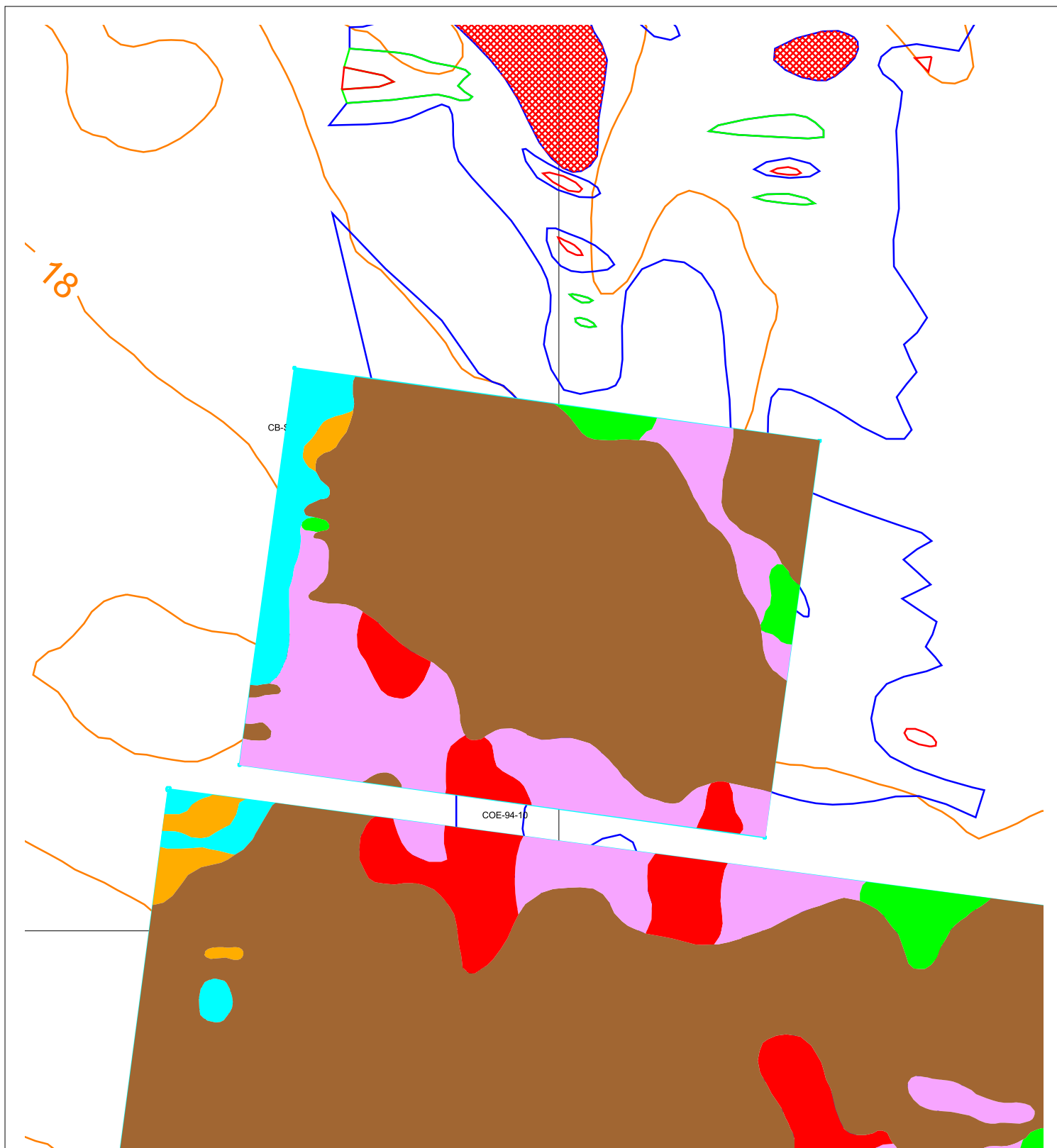
Pinellas Borrow Area Bottom Classification Map

- Dense Hardbottom (>75% Cover), High Relief (>100 cm)
- Dense Hardbottom (>75% Cover), Medium Relief (30cm-100cm)
- Scattered Hardbottom (20% - 75% Cover), Medium Relief (30cm-100cm)
- Scattered Hardbottom (20% - 75% Cover), Low Relief (<30cm)
- Patchy Hardbottom (<20% Cover), Low Relief (<30cm)
- Sand

2000 0 2000 4000 Feet



Borrow Area "D" Marine Resource Map	
Preliminary Draft Marine Biological Survey Pinellas County SPP	
Scale: 1" = 2,000'	Drawn By: MR
Date: December, 2001	
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	Figure 15




Pinellas Borrow Area Bottom Classification Map

- Dense Hardbottom (>75% Cover), High Relief (>100 cm)
- Dense Hardbottom (>75% Cover), Medium Relief (30cm-100cm)
- Scattered Hardbottom (20% - 75% Cover), Medium Relief (30cm-100cm)
- Scattered Hardbottom (20% - 75%, Cover), Low Relief (<30cm)
- Patchy Hardbottom (<20% Cover), Low Relief (<30cm)
- Sand

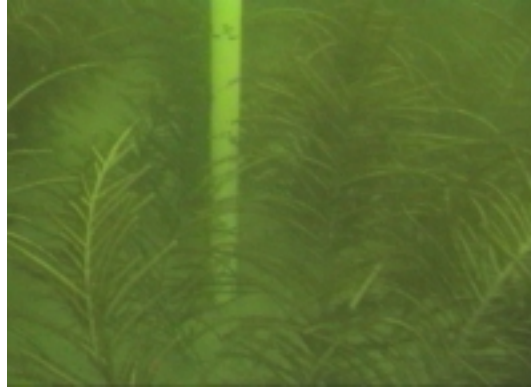
1500 0 1500 3000 Feet



Borrow Area "E" Marine Resource Map	
Preliminary Draft Marine Biological Survey Pinellas County SPP	
Scale: 1" = 1,500'	Drawn By: MR
Date: December, 2001	
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	Figure 16

3.2.5.1 Habitat Description

Marine resources in Area E were predominately comprised of low/medium relief exposed rock features (Figure 16) (Table 6). In total, 134.9 acres of habitat were scattered low/medium relief hardbottom. In most areas the hardbottom features were merely scattered rock/rubble with associated sponges, algae, and coral (Photograph 6). Large areas adjacent to and among these rubble areas consisted of large octocorals (*Pseudoterogorgia sp.*, *Plexaurella nutans* etc.) (Photograph 7). Within these areas of dense gorgonians, the relief averaged over 50 cm. The surrounding rock features in the area had average relief of less than 20 cm.



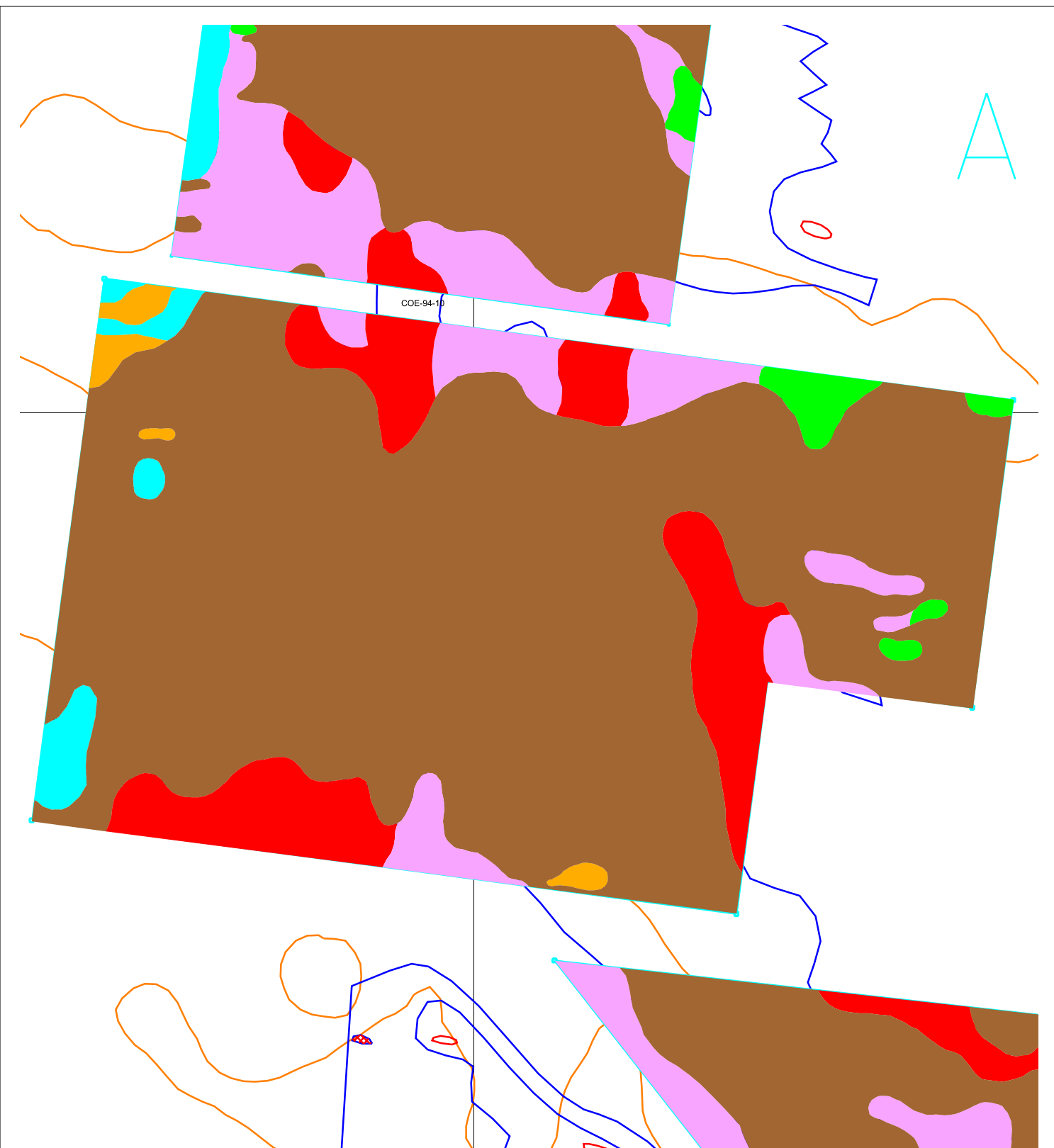
Photograph 7. Octocoral community within Area E

3.2.6 Borrow Area F

Directly south of Area E is 1,410.5-acre Area F (Figure 2). Habitat distribution within this area was a total of 315 acres of hardbottom habitat and 1,095.6 acres of open sand (Figure 17).

3.2.6.1 Habitat Description

Borrow Area F has over 187 acres of high quality dense medium/high relief hardbottom habitat (Table 6). Hardbottom areas within Area F are comprised of scleractinian species such as *Solenastrea hyades* (Photograph 8), as well as a variety of gorgonian species. Also present within this area were large overgrowing tunicates (Family Didemnidae). Fishes observed within these hardbottom habitats included numerous sea robins (*Prionous sp.*), moray eels (*Gymnothorax sp.*), and juvenile grunts. Invertebrate species encountered included the very common *Luidia clathrata*, *Lytechinus variegatus*, and *Echinometra lucunter*, as well as a very large specimen of the lightning whelk, *Busycon contrarium* (Photograph 9). Another 100 acres of scattered low/medium relief also occurs within this area. A typical view of this relief is shown in Photograph 10.




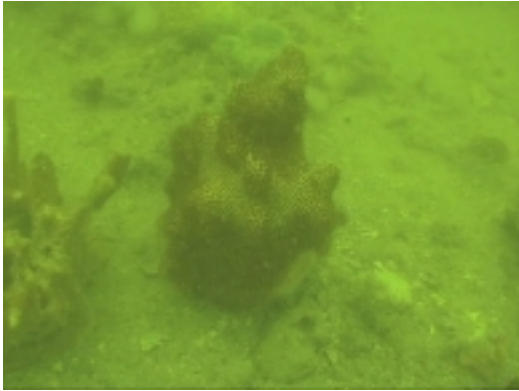
Pinellas Borrow Area Bottom Classification Map

- Dense Hardbottom (>75% Cover), High Relief (>100 cm)
- Dense Hardbottom (>75% Cover), Medium Relief (30cm-100cm)
- Scattered Hardbottom (20% - 75% Cover), Medium Relief (30cm-100cm)
- Scattered Hardbottom (20% - 75%, Cover), Low Relief (<30cm)
- Patchy Hardbottom (<20% Cover), Low Relief (<30cm)
- Sand

1500 0 1500 3000 Feet



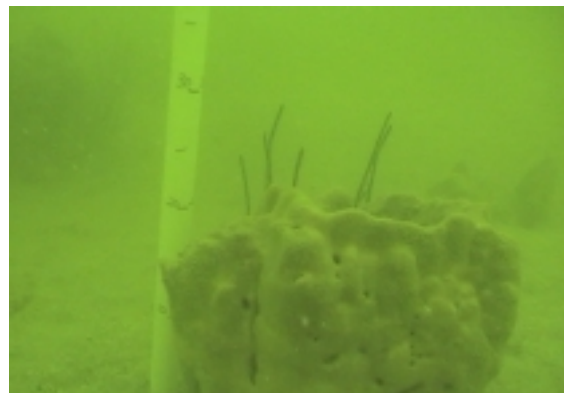
Borrow Area "F" Marine Resource Map	
Preliminary Draft Marine Biological Survey Pinellas County SPP	
Scale: 1" = 1,500'	Drawn By: MR
Date: December, 2001	
 DIAL CORDY AND ASSOCIATES INC. Environmental Consultants	J01-493
	Figure 17



Photograph 8. *Solanastrea hyades* coral typical to dense hardbottom areas in Area F.



Photograph 9. Large lightning whelk found in Area F.

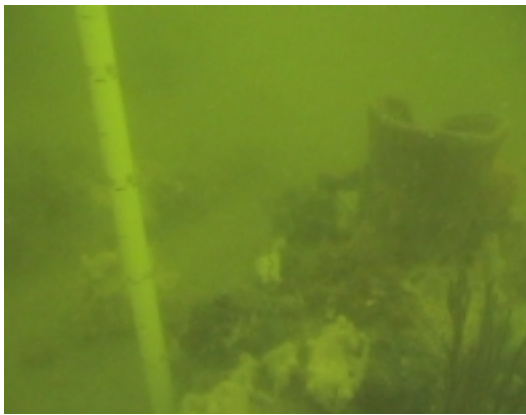


Photograph 10. Typical scattered low relief habitat in Area F.

3.2.7 Borrow Area G

Borrow Area G is the closest to shore of all the borrow areas (1.8 nm) and also has a large percentage of sand available (1,142.5.0 acres, 85 percent). Hardbottom areas within Area G only totaled 15 percent (201.9) of the total 1,344.4 acres surveyed. Most of these hardbottom areas were small distinct patches low/medium relief hardbottom scattered throughout the area. These patches ranged in size from 1.3 acres to over 17 acres. The remainder of the hardbottom present within the area was found along the western and northern ends of the borrow area and included areas of dense hardbottom (Figure 18).

3.2.7.1 Habitat Description



Photograph 11. Typical relief of scattered medium relief habitat in Area G.

With a vertical relief of 35 cm, the scattered medium relief hardbottom present within Area G represented some of the highest quality hardbottom encountered during the survey. Large gorgonian species interspersed with large sponges and hard corals typified the area. Photograph 11 shows some of the typical relief within the area. Some areas within Area G had a relief of over 50 cm. *Ircinia* sp., *Cribrochalina vasculum*, and *Spheciospongia vesparium* were the most common porifera species encountered. The gorgonian, *Leptogorgia virgulata*, was also common within the area.

3.2.8 Borrow Area H

The largest borrow area surveyed was Area H (Figure 19). In total, Area H encircles 3,202.1 acres of seafloor, 2.8 miles offshore of Sand Key. Within this area there was a total of 2533.8 acres of open sand habitat, the largest of all areas surveyed. This represents 80 percent of the total acreage within Area H. Hardbottom habitats within this potential borrow area covered 668.3 acres.



Pinellas Borrow Area Bottom Classification Map

- Dense Hardbottom (>75% Cover), High Relief (>100 cm)
- Dense Hardbottom (>75% Cover), Medium Relief (30cm-100cm)
- Scattered Hardbottom (20% - 75% Cover), Medium Relief (30cm-100cm)
- Scattered Hardbottom (20% - 75%, Cover), Low Relief (<30cm)
- Patchy Hardbottom (<20% Cover), Low Relief (<30cm)
- Sand

2000 0 2000 4000 Feet



Borrow Area "G" Marine Resource Map

Preliminary Draft Marine Biological Survey
Pinellas County SPP

Scale: 1" = 2,000'

Drawn By: MR

Date: December, 2001



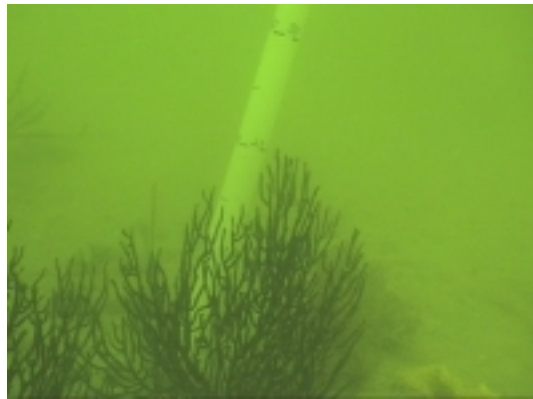
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J01-493

Figure 18

3.2.8.1 Habitat Description

Habitat distributions varied across Area H. In the western half of the borrow area, randomly distributed patches of scattered medium relief hardbottom were typical (Figure 19). These areas vary in size from small areas (< 1.0 acre) to large tracts of hardbottom (70 acres). In the eastern half of Area H, the northeast section is composed of a large area of open sand habitat. This area encompasses over 2,500 acres of area. Vertical relief of resources within Area H averaged just over 30 cm (Photograph 12). Marine resources here were similar to those found in other areas, with large sponges and gorgonians being the dominant species. Numerous sea robins were also seen on the sand areas interspersed between hardbottom areas.



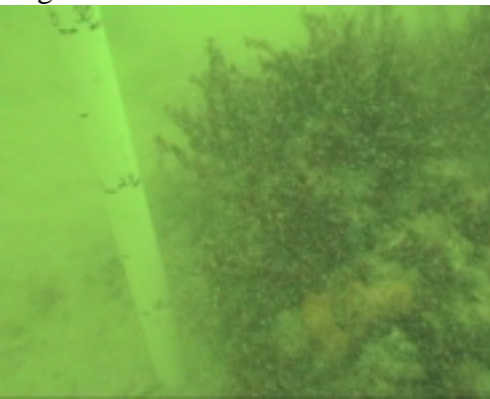
Photograph 12. Typical relief of hardbottom in Area H.

3.2.9 Borrow Area I

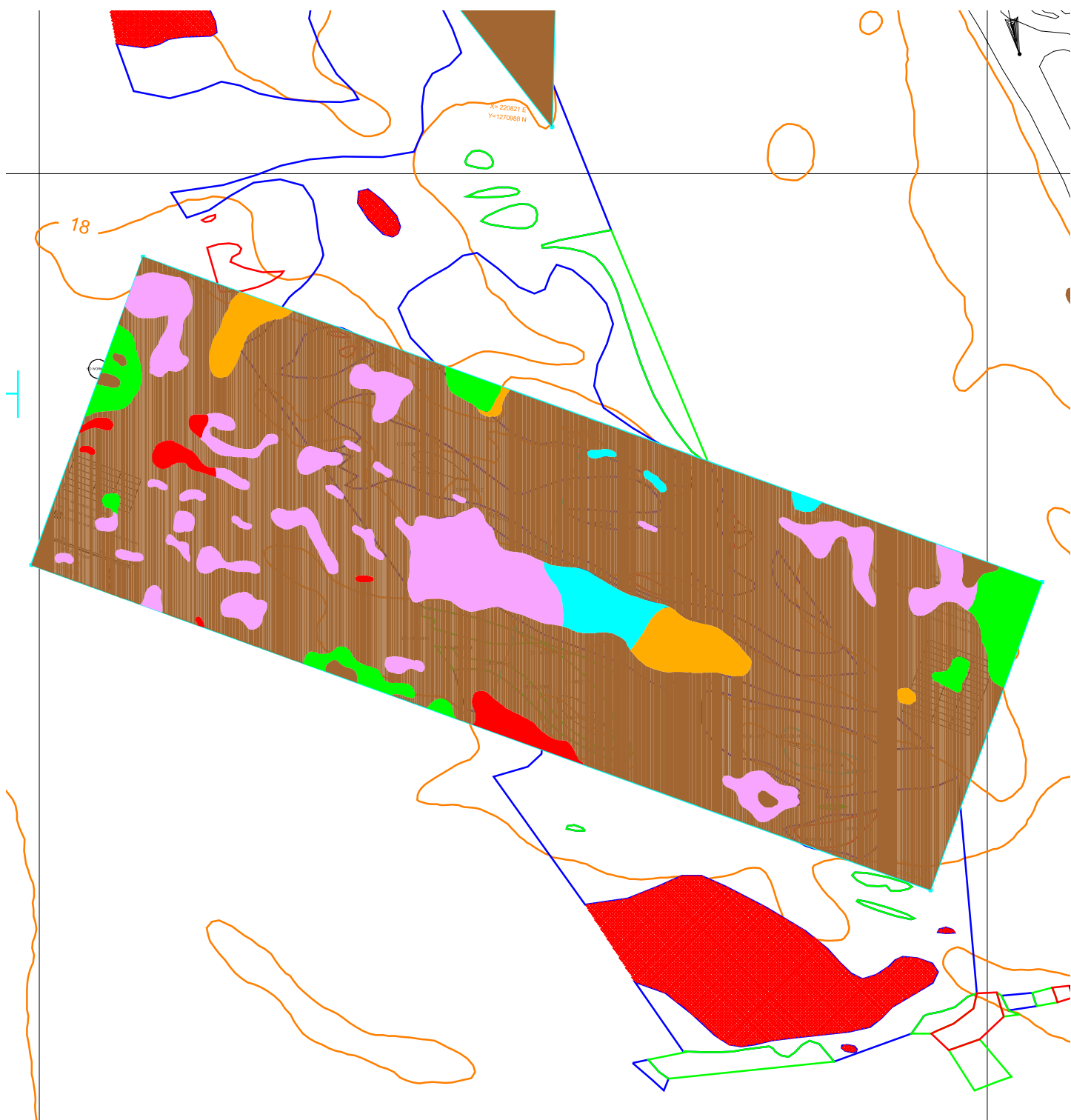
The northern most offshore area surveyed in Borrow Area I, located 3.0 nm offshore of Clearwater Pass (Figure 2). Area I is also the smallest area surveyed at only 527.3 acres. Within Area I a total of 212.3 acres of hardbottom resources were mapped. The remaining 315.3 acres consisted of open sand habitat (Figure 20).

3.2.9.1 Habitat Description

Hardbottom resources within Area I can be separated into two large areas. Along the northern edge of the area is a 61.9-acre area of hardbottom. In addition to this, a 56.9-acre area runs along the eastern edge (Figure 20). Throughout the middle of borrow area lies 375.7 acres of unvegetated sand habitat. Much of the hardbottom present in these two areas is scattered medium relief. Average relief in this area averaged 32 cm, with a few gorgonian species approaching 100 cm in height. Exposed rock within this area was covered with a combination of sponges, *Sargassum* sp., colonial tunicates (*Clavelina* sp.), and hard corals (Photograph 13). The sand perch (*Diplectrum fromosum*) was common in the area, and a triton's trumpet (*Charonia variegata*) was also observed.



Photograph 13. Hard coral assemblage typical to Area I.




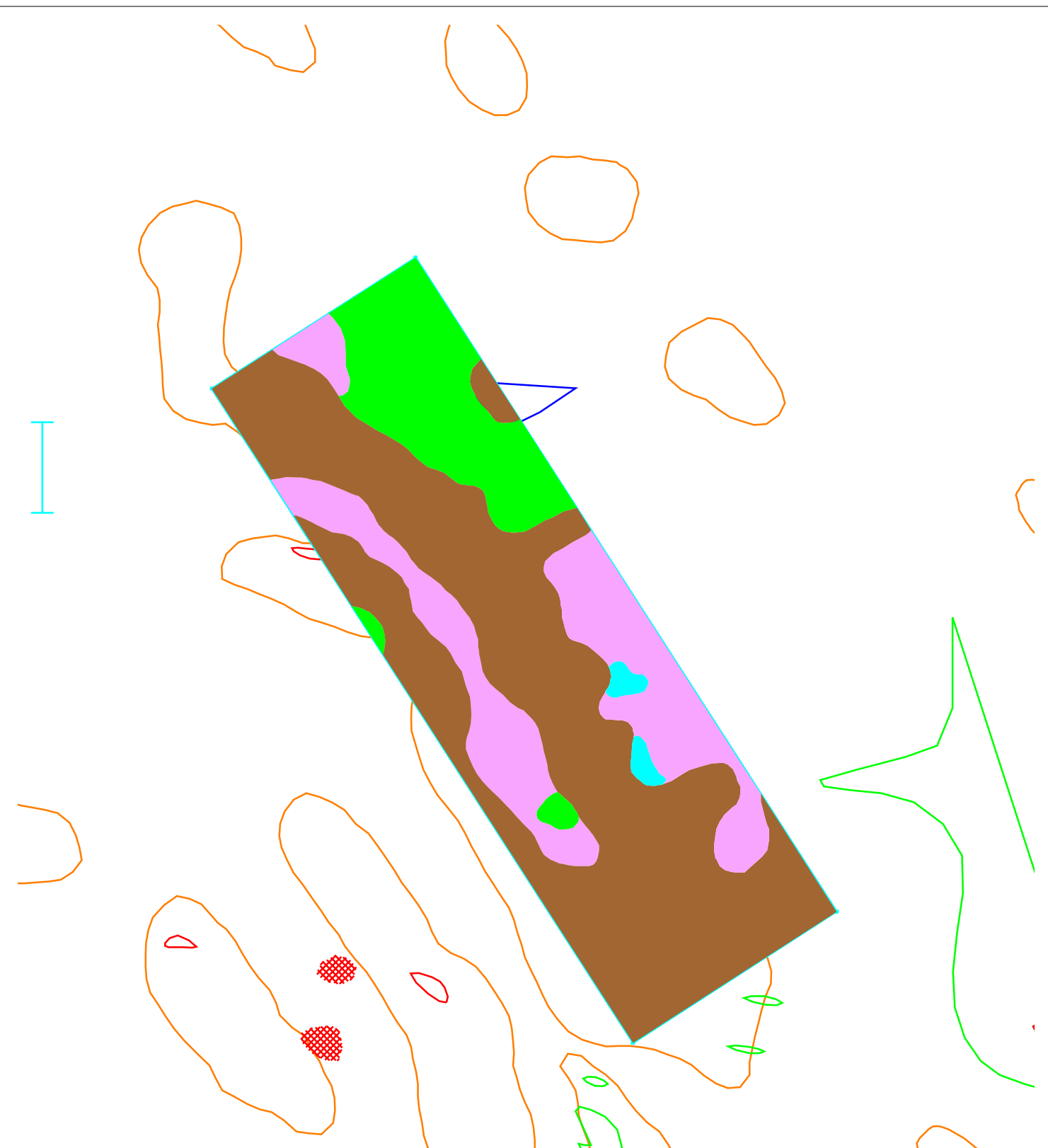
Pinellas Borrow Area Bottom Classification Map

- Dense Hardbottom (>75% Cover), High Relief (>100 cm)
- Dense Hardbottom (>75% Cover), Medium Relief (30cm-100cm)
- Scattered Hardbottom (20% - 75% Cover), Medium Relief (30cm-100cm)
- Scattered Hardbottom (20% - 75%, Cover), Low Relief (<30cm)
- Patchy Hardbottom (<20% Cover), Low Relief (<30cm)
- Sand

3000 0 3000 6000 Feet



Borrow Area "H" Marine Resource Map	
Preliminary Draft Marine Biological Survey Pinellas County SPP	
Scale: 1" = 3,000'	Drawn By: MR
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	Figure 19




Pinellas Borrow Area Bottom Classification Map

- Dense Hardbottom (>75% Cover), High Relief (>100 cm)
- Dense Hardbottom (>75% Cover), Medium Relief (30cm-100cm)
- Scattered Hardbottom (20% - 75% Cover), Medium Relief (30cm-100cm)
- Scattered Hardbottom (20% - 75%, Cover), Low Relief (<30cm)
- Patchy Hardbottom (<20% Cover), Low Relief (<30cm)
- Sand

1500 0 1500 3000 Feet



Borrow Area "I" Marine Resource Map	
Preliminary Draft Marine Biological Survey Pinellas County SPP	
Scale: 1" = 1,500'	Drawn By: MR
Date: December, 2001	
 DIAL CORDY AND ASSOCIATES INC. Environmental Consultants	J01-493
	Figure 20

3.3 Ebb Shoal Borrow Areas

In addition to the nine offshore borrow areas, five ebb tidal shoal borrow areas were also surveyed for marine resources. These included John's Pass, Blind Pass, Pass-A-Grille north, Pass-A-Grille south, and Egmont Shoal (Figures 21 and 22). No hardbottom or seagrass was documented within these ebb shoal areas. All areas consisted of large shallow areas of sand. In the John's Pass, Blind Pass, and the Pass-A-Grille survey areas, portions of the shoals are exposed during low tide events. In total within these ebb tidal shoal survey areas there are 1,569.5 acres of sand habitat.

3.4 Nearshore Breakwater Areas

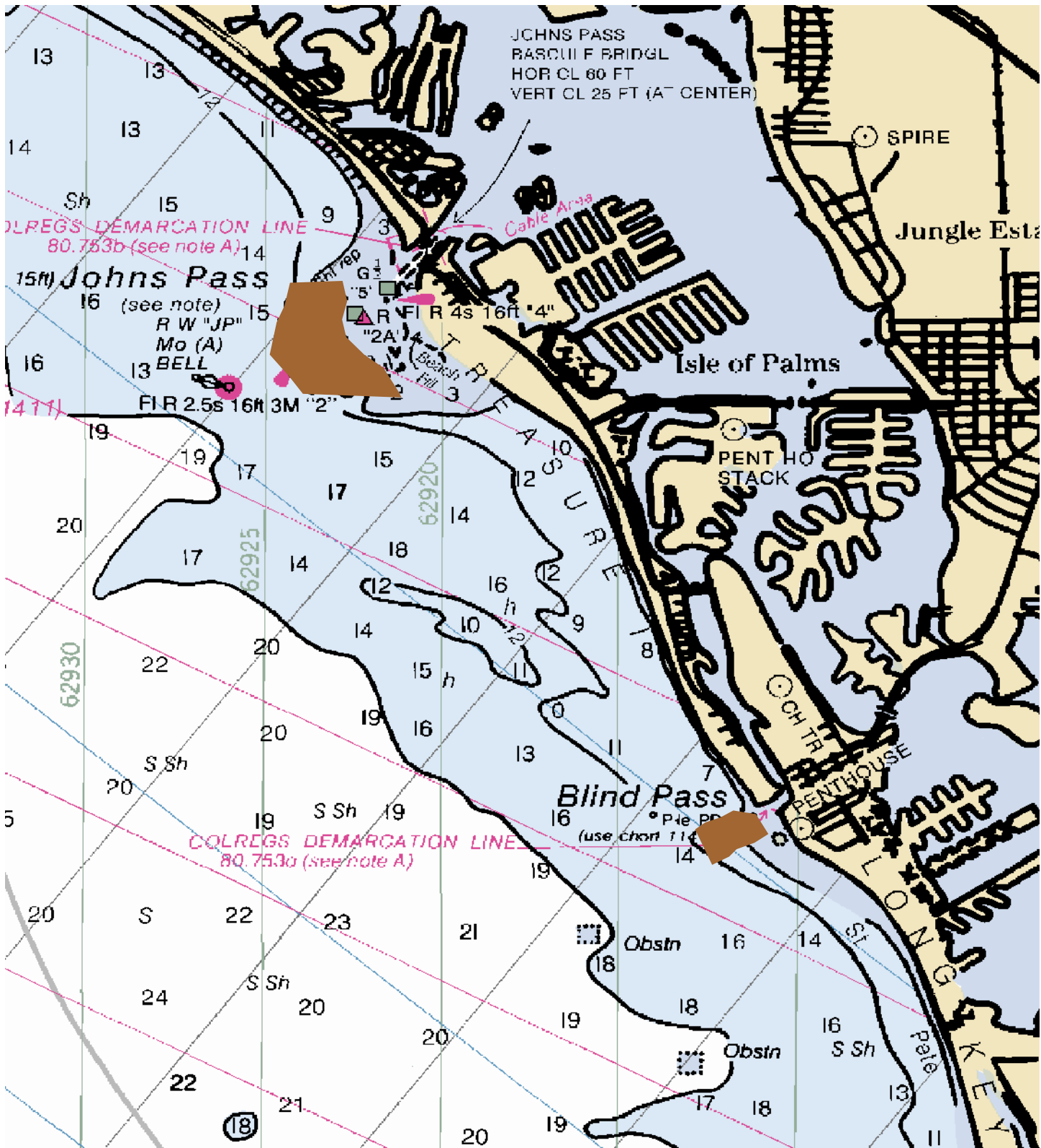
In addition to the potential borrow areas surveyed, two nearshore areas to be used as breakwater areas were also surveyed. These included an area just offshore of North Reddington Beach and an area off of Indian Rocks Beach (Figure 23 and 24).

3.4.1 North Reddington Beach Breakwater Area

The North Reddington Beach breakwater area is just offshore between Department of Environmental Protection (DEP) monuments R-105 and R-107. The area surveyed includes a total of 28.3 acres, with 3.7 acres being scattered medium relief, 1.1 acres of high relief hardbottom, and 23.5 acres of sand (Figure 23).

3.4.1.1 Habitat Description

Hardbottom habitats within the North Reddington Beach breakwater area occur in the northern and southern sectors of the survey block. Within the northern reach of the area surveyed there is an area of high relief dense hardbottom (Figure 23). Octocorals and sponges, with small-interspersed scleractinian corals, dominate this area of dense high relief hardbottom. This habitat changes into the larger scattered medium relief area totaling just over 1.0 acre in area. Another area of medium relief scattered and high relief hardbottom is located in the southeastern corner of the survey area. Sand areas between the hardbottom areas are dominated by echinoderms and mollusks, in particular the sand dollar (*Mellita quinquiesperforata*).



JOHNS PASS
 BASCULF BRIDGL
 HOR CL 60 FT
 VERT CL 25 FT (A" CENTER)

SPIRE

Jungle Esta

COLREGS DEMARCATION LINE
 80.753b (see note A)

Johns Pass

15th (see note)
 R W "JP"
 Mo (A)
 BELL
 F I R 2.5s 16ft 3M "2"

R F I R 4s 16ft "4"
 "2A"

Isle of Palms

PENT HO
 STACK

Blind Pass

(use chart 114)

COLREGS DEMARCATION LINE
 80.753a (see note A)

Obstn

Obstn

S Sh

13

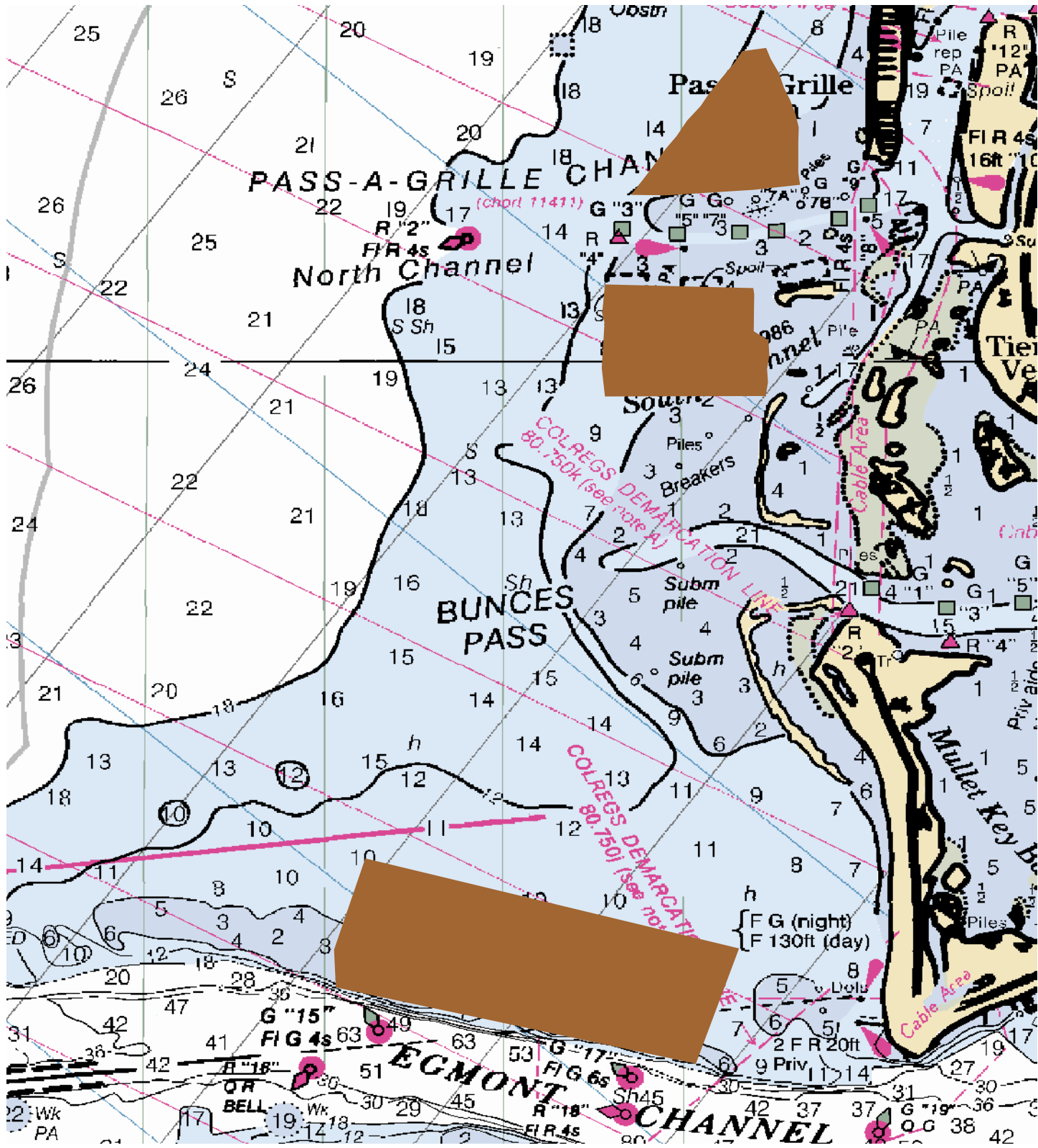
Ebb Tidal Shoals Bottom Classification Map

Sand

4000 0 4000 8000 Feet



Ebb Tidal Shoals - North Resource Map	
Preliminary Draft Marine Biological Survey Pinellas County SPP	
Scale: 1" = 4,000'	Drawn By: MR
Date: December, 2001	
DIAL CORDY AND ASSOCIATES INC Environmental Consultants	J01-493
	Figure 21



Ebb Tidal Shoals Bottom Classification Map

Sand

4000 0 4000 8000 Feet



Ebb Tidal Shoals - South Resource Map

Preliminary Draft Marine Biological Survey
Pinellas County SPP

Scale: 1" = 4,000'

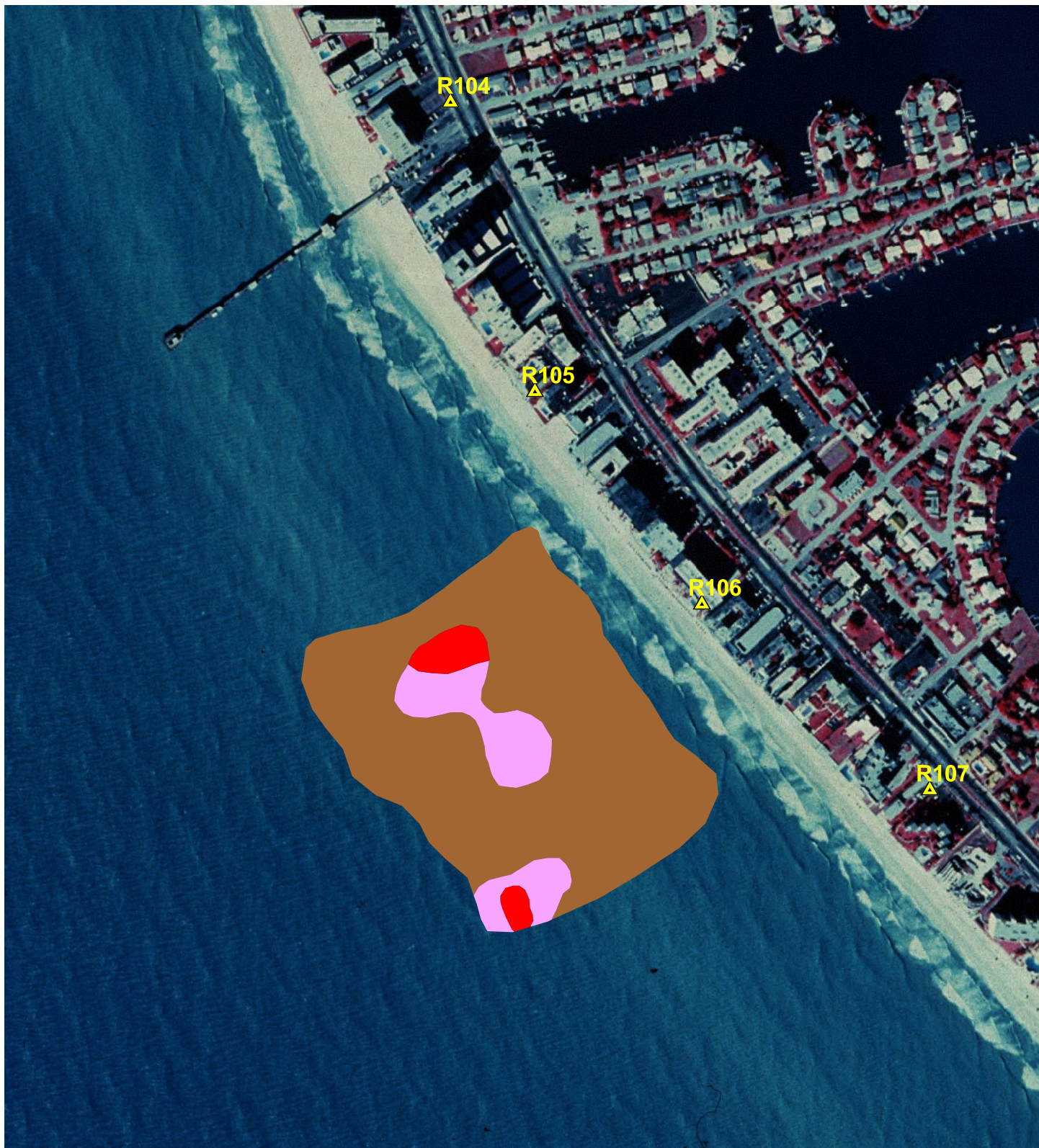
Date: December, 2001

Drawn By: MR



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Figure 22



- ▲ FDNR Range Monument
Pinellas Nearshore Bottom Classification Map
 ■ Dense Hardbottom (>75% Cover), High Relief (>100cm)
 ■ Scattered Hardbottom (20-75% Cover), Medium Relief (30-100cm)
 ■ Sand

500 0 500 1000 Feet



North Reddington Beach Breakwater Marine Resource Map

Preliminary Draft Marine Biological Survey
Pinellas County SPP

Scale: 1" = 500'

Drawn By: MR

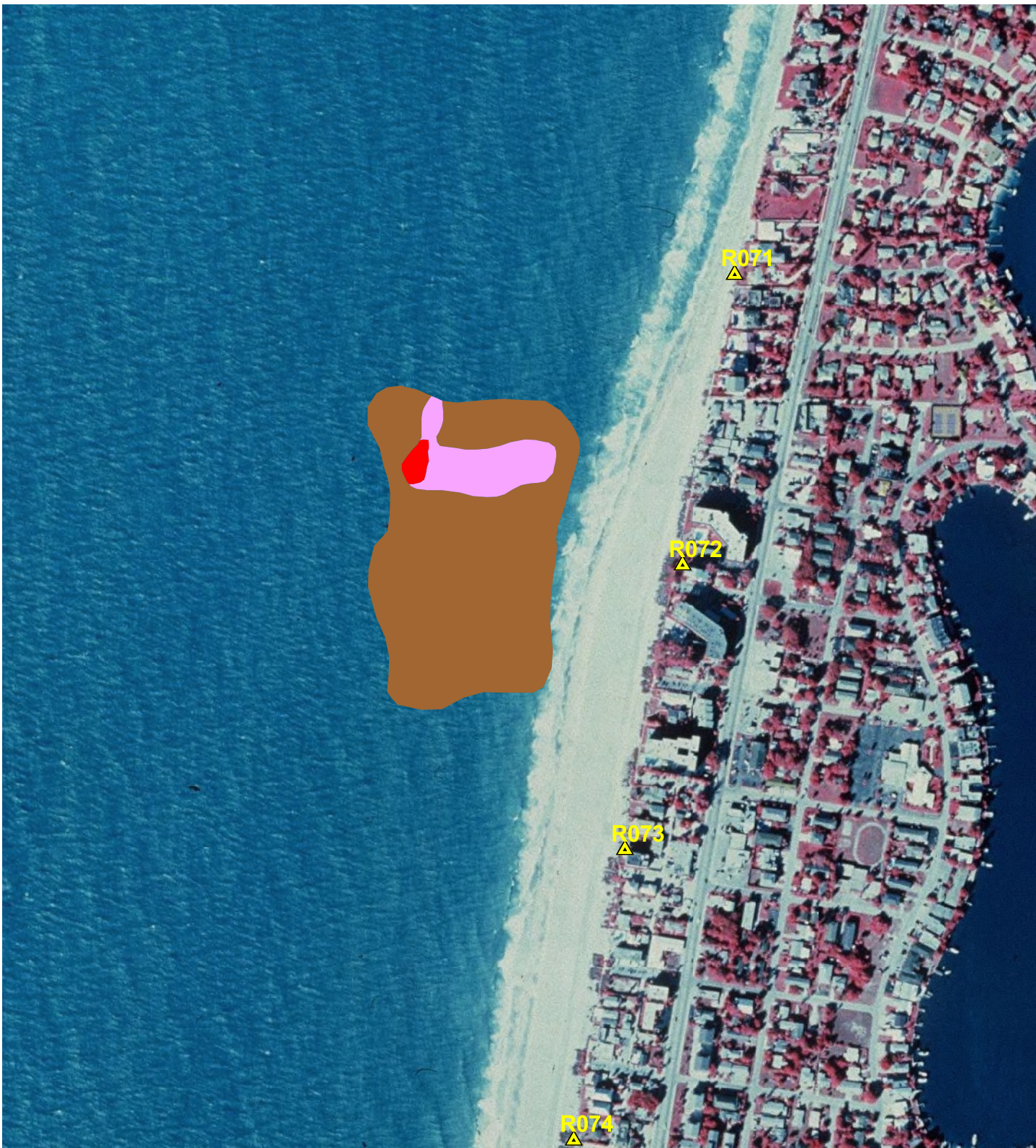
Date: December, 2001



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Figure 23



- ▲ FDNR Range Monument
 Pinellas Nearshore Bottom Classification Map
 ■ Dense Hardbottom (>75% Cover), High Relief (>100cm)
 ■ Scattered Hardbottom (20-75% Cover), Medium Relief (30-100cm)
 ■ Sand

500 0 500 1000 Feet



Indian Rocks Beach Breakwater Marine Resource Map	
Preliminary Draft Marine Biological Survey Pinellas County SPP	
Scale: 1" = 500'	Drawn By: MR
Date: December, 2001	
 DIAL CORDY AND ASSOCIATES INC. <small>Environmental Consultants</small>	J01-493
	Figure 24

3.4.2 Indian Rocks Beach Breakwater Area

The breakwater survey area off of Indian Rocks Beach (DEP monuments R-71 to R-73) is a 28.3-acre block with a small area of hardbottom present (Figure 24). Overall, there are 3.7 acres of scattered medium relief hardbottom habitat and a 1.1-acre area of high relief hardbottom habitat.

3.4.2.1 Habitat Description

Hardbottom habitat within the Indian Rocks Beach breakwater survey block included 2.3 acres of scattered medium relief habitat in the northern section of the survey area. A small area (0.3 acres) of high relief dense hardbottom habitat is also found in the northeast corner of the survey block. This area exhibits more exposed rock area and larger gorgonian and sponge species. The majority of the area surveyed within this area was open sand habitat (14.0 acres).

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